

## **Utility Advisory Commission Regular Meeting**

### **Agenda**

Thursday, April 1, 2021

7:00 pm – Gardner City Hall Council Chambers

#### **CALL TO ORDER**

#### **PLEDGE OF ALLEGIANCE**

#### **PUBLIC COMMENT**

#### **CONSENT AGENDA**

1. Standing approval of the minutes as written for the March 4, 2021 meeting of the Utility Advisory Commission.

#### **NEW BUSINESS**

1. Consider a recommendation to City Council for awarding a contract to Haynes Equipment in the amount of \$317,580 for the Kill Creek WRRF UV Disinfection and Recycled Water Systems, Project No. WW2001

#### **DISCUSSION ITEMS**

1. Project Updates.

#### **OTHER BUSINESS**

#### **ADJOURNMENT**

**UTILITIES ADVISORY COMMISSION STAFF REPORT CONSENT AGENDA ITEM #1**  
**MEETING DATE: APRIL 1, 2021**  
**STAFF CONTACT: GONZ GARCIA, UTILITIES DIRECTOR**

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**AGENDA ITEM:** Standing approval of the minutes as written for the March 4, 2021 meeting of the Utilities Advisory Commission.

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**Background:**

The draft minutes for the March 4, 2021 Utilities Advisory Commission meeting are attached.

**Staff Recommendation:**

Staff recommends approval of the minutes for the March 4, 2021 meeting of the Utilities Advisory Commission.

**Attachments:**

- Draft minutes of the March 4, 2021 Utilities Advisory Commission meeting.

**RECORD OF PROCEEDINGS  
OF THE UTILITY ADVISORY COMMISSION  
GARDNER, KANSAS  
Page No. 2021-04  
March 4, 2021**

The Utilities Advisory Commission of Gardner, Kansas, met in Regular Session on March 4, 2021, at City Hall. Present were Chairperson Kristina Harrison, Vice-Chairperson Jake Wells, Commissioner Bryce Augustine, Utilities Department Director Gonzalo Garcia and Administrative Assistant Erin Groh. Commissioner Gary Williams and Commissioner Barbara Coleman were not in attendance.

**CALL TO ORDER**

The meeting was called to order at 7:00 p.m. by Chairperson Kristy Harrison.

**PLEDGE OF ALLEGIANCE**

**CONSENT AGENDA**

- 1. Standing approval of the minutes as written for the January 7, 2021, meeting of the Utility Advisory Commission.**
- 2. Consider the appointment of Matt Ponzer as Director 1 to the KMEA Board of Directors.**

Commissioners approved a recommendation to City Council to approve the appointment of Matt Ponzer to serve as a City of Gardner representative as Director #1 with voting rights to the Kansas Municipal Energy Agency (KMEA) Board of Directors.

Motion by Commissioner Augustine, seconded by Commissioner Wells, to forward the appointment of Matt Ponzer as Director #1 to City Council.

Motion carried 3-0 Aye (2 absent)

**NEW BUSINESS**

- 1. Consider a recommendation to the City Council to award a service contract for the 2021 Hillsdale WTP Waste & Residual Pond Cleanout Project.**

Director Garcia presented the staff report. Hillsdale Water Treatment Plant had two retention basins (commonly referred to as ponds or lagoons) used to hold all sludge generated from back washed that came from clarifiers and backwashing of the media filters. Historically, one pond was cleaned out every year. In September 2019, both the west pond and east pond at Hillsdale WTP were cleaned out. The east pond was cleaned out and removed completely to make room for the plant expansion. The expansion project constructed two new waste residual ponds on site and those are tested and approved for operation. Therefore, this project will clean the existing west holding pond, so that the expansion project can complete the appropriate abandonment process outlined by KDHE and repurpose this area for the expansion project to use.

Two bids were received for the project. One from Denali Water Solutions, LLC for \$54,779 and one from Hodges Farms & Dredging, LLC for \$73,739. Denali had the lowest price, and after staff reviewed the bids, they would like to recommend Denali to work on the project.

Motion by Commissioner Augustine, seconded by Commissioner Wells to forward a recommendation to City Council to award a service contract to Denali Water Solutions, LLC, in the amount not to exceed \$54,779 for the 2021 Hillsdale Water Treatment Plant Waste & Residuals Pond Cleanout Project.

Motion carried 3-0 Aye (2 absent)

## **DISCUSSION ITEMS**

### **1. Project Updates.**

Director Garcia gave a brief update on the current status of the Hillsdale Water Treatment Plant Expansion project. The startup will be late April or early May. The new expansion will be operational by late May.

Garcia went over the recent energy crisis and how Gardner was affected by the frozen well heads in Texas. The price of gas went from under \$3 to around \$624 per million BTU (MMBTU). The cost for producing energy went up because we use the gas to generate the power. We normally pay around \$24 per megawatt hour but it went up to about \$3400. It was about 100 times more than usual for the cost. Utilities received an invoice from KMEA and the cost for the two weeks was around \$5 million dollars. It is the budget amount that we normally pay over six months. The city is looking at how to pay for this extraordinary amount. One way is through the power cost adjustment (PCA) that is spread throughout a 12 month average. A PCA appears in customer's electric bills and the actual customer has to pay for the excess cost of energy. The city has not determined if it will pass the cost onto the customer by increasing rates or if they will absorb the cost into the Electric fund. Chair Harrison asked what the increase in the bill would be and Director Garcia stated that it hadn't been determined yet but he thinks it might be 2 to 4 cents per bill per kilowatt hour in addition to the current rate. Garcia stated that at the City Council meeting on March 1<sup>st</sup>, it was determined that council would like to have a subcommittee created that would help determine how this large cost would be handled. He asked UAC commissioners if anyone would like to be a part of the subcommittee and Vice-Chair Wells and Commissioner Augustine agreed to join the committee. Garcia stated the subcommittee would start to meet in about a week.

Commissioner Augustine asked if any turbine generators were started up [during the crisis] and Garcia stated that they were not fired up due to the cost of the gas to run them. He said that there are a lot more efficient units that would have priority over our gas turbines. Augustine asked if the turbines run on gas and diesel. Garcia said they run on gas or diesel however the burners we have installed now are run on gas and in order to have them run on diesel, it would take the removal of the gas burners and it would take at least about 5-7 days. It takes an enormous amount of diesel to run the turbines and so it is not very practical to run them. Augustine asked if they are tested and Garcia stated that they are tested about 1-2 times per year.

Chair Harrison asked if there would be an option to extend the PCA over more than a year. Garcia stated that it would be possible to extend it over more than 12 months. Harrison was concerned that customers will see the PCA and think that it is finite and a rate increase that won't be reversed. Garcia said that he will ask about that possibility to have it spread out longer than 12 months.

## **OTHER BUSINESS**

### **1. Rebate Program.**

Director Garcia discussed possible ideas for a rebate program for residential homes. Garcia said that he has used the resources provided to him by Ecologix and information he has researched on the web to formulate some ideas. He found that for the smart thermostats, most utilities offer a \$50 to \$75 rebate. On



**RECORD OF PROCEEDINGS  
OF THE UTILITY ADVISORY COMMISSION  
GARDNER, KANSAS**

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March 4, 2021

the LED bulbs, there was a lot of information out there, but most programs will do a \$1-5 rebate per bulb. Some cities have a limit of 5-20 bulbs. He saw the for the power strips some cities offer a rebate that ranges from \$10-20. For Water irrigation controllers, he saw a \$200 rebate in Arizona and a \$75 rebate in Colorado. New Mexico had a rebate of 25% of the cost up to \$100, Nevada, 50% of the cost up to \$200, North Carolina a rebate of 50% of the cost up to \$200 and so on. Garcia presented a table summarizing his findings as well as ideas for Gardner to implement. Garcia asked if there are any ideas or changes that commissioners wanted to discuss. Chair Harrison asked if the proposed rebates would be just a one time rebate per household or would it be something customers could do every year. Garcia stated that he felt that it should be a one time rebate per household. Vice-Chair Wells felt that we could offer up the rebates to customers and see how the first year goes and see if there's a positive effect from it and decide later if we should extend the program or not. Garcia had an idea that it would be nice if customers could take their customer number to a hardware store and the store could possibly allow customers to put in a code to get a discount [for bulbs, power strips, etc] and then maybe the company could send the city a bill to pay for the discount. Harrison stated it might make it easier for us to manage. Garcia said that the accounting of it is his only concern about the rebates. He wants to explore the rebates further and discuss it again at the next meeting.

**ADJOURNMENT**

Motion by Vice-Chairperson Wells, seconded by Commissioner Augustine, to adjourn the meeting at 7:25 p.m.

Motion carried 3-0 Aye (2 Absent)

/s/ \_\_\_\_\_ Erin Groh

Utilities Department Administrative Assistant

## **UTILITY ADVISORY COMMISSION**

### **STAFF REPORT**

### **NEW BUSINESS ITEM No. 1**

**MEETING DATE:**      **APRIL 1, 2021**

**STAFF CONTACT:**    **GONZ GARCIA, UTILITIES DIRECTOR**

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**AGENDA ITEM:**      Consider a recommendation to City Council for awarding a contract to Haynes Equipment in the amount of \$317,580 for the Kill Creek WRRF UV Disinfection and Recycled Water Systems, Project No. WW2001.

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#### **Background:**

The Kill Creek Water Resource Recovery Facility has been in operation for approximately 20 years. As part of the treatment process, the facility uses an ultraviolet disinfection system prior to the effluent being discharged to Kill Creek, a tributary of the Kansas River.

Microorganisms in the effluent pass by special UV lamps which damages the genetic DNA rendering the microorganisms sterile. Unable to reproduce and multiply, the microorganisms no longer pose a health risk.

Non-potable recycled water is used throughout the plant using the disinfected effluent. This recycled water is used at multiple stages of the treatment process including wash down of equipment, batch tanks for dewatering process, and spray bars along the oxidation ditch. The recycled water is also used for all the frost free hydrants at the facility and ability to irrigate the property using a sprinkler system.

The current UV disinfection and Recycled Water systems is original and has reached the end of the useful life for this type of equipment.

The proposed UV Disinfection System will reduce the amount of electrical consumption while providing improved disinfection of the effluent and the proposed non-potable recycled water system provides a smaller footprint than the existing equipment. These proposed systems will decrease maintenance, require less labor to perform maintenance, and provide greater savings due to lower energy usage.

#### **RFP Process:**

The Request for Proposals was advertised on the City of Gardner website, Drexel website and The Legal Record, from February 9, 2021 to March 2, 2021. A total of five (5) responses to the request for proposals were received for the UV Disinfection System and two (2) responses for the Recycled Water System.

Utilities staff has reviewed the proposals presented by Haynes Equipment for both the UV Disinfection and Recycled Water Systems and agree the equipment provided meet and exceed all of the requirements as set forth in the RFP.

**Staff and Committee Recommendation:**

Consider a recommendation to the City Council for awarding a contract to Haynes Equipment in the amount of \$317,580 for the Kill Creek WRRF UV Disinfection and Recycled Water Systems, Project No. WW2001.

**Attachments:**

- Request For Proposals
- Haynes Equipment Proposal for Glasco UV NONCON Disinfection System
- Haynes Equipment Proposal for Grundfos Recycled WaterSystem

# **Gardner Utilities Department**



## **REQUEST FOR PROPOSALS**

### **Kill Creek Water Resource Recovery Facility Ultraviolet Disinfection System and Recycled Water Pump Systems**

#### **Project WW2001**

February 2021

Contact Information  
Ric Gere, Utilities Staff Engineer (913) 568-8123



## REQUEST FOR PROPOSALS

### KILL CREEK WATER RESOURCE RECOVERY FACILITY UV Disinfection and Recycled Water Pump Systems Project WW2001

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**Issue Date:** February 9, 2021

**Pre-Proposal Question Deadline:** February 23, 2021 at 12:00 PM

**RFP Proposal Deadline:** March 2, 2021 at 12:00 PM  
City of Gardner  
Utilities Department  
1150 E. Santa Fe Street  
Gardner, KS 66030

**Contact:** Ric Gere, Utilities Staff Engineer  
Phone: (913) 568-8123  
Email: [rgere@gardnerkansas.gov](mailto:rgere@gardnerkansas.gov)

**Description:** The City of Gardner is requesting qualified Vendors to submit proposals on an ultraviolet disinfection system and/or recycled water pump system to be installed by others at the Kill Creek Water Resource Recovery Facility. It is the intent of the City to pre-select and secure price for purchase of two separate equipment systems and enter into additional contract with an installation contractor for the removal and replacement of the existing equipment from service.

This project qualifies for sales tax exemption for purchasing of equipment, materials and supplies.

A mandatory site visit will be required for each Vendor to conduct and evaluate current equipment installation to determine equipment to be recommended in their Proposal.

Site visits shall be coordinated and scheduled by contacting:  
Scott Millholland,  
Kill Creek Water Resource Recovery Facility Superintendent  
Office: 913.856.0986  
[smillholland@gardnerkansas.gov](mailto:smillholland@gardnerkansas.gov)

Sealed proposals for the **UV Disinfection and Recycled Water Pump Systems** will be accepted by the City of Gardner, Kansas, at the Utilities Director's Office, Utilities Department Administration Building, 1150 E. Santa Fe Street, Gardner, Kansas, 66030, until **12:00 P.M.** (local time) **March 2, 2021**, at which time the proposals will be taken under advisement, and the names of respondents will be made available for public record; all other information is confidential until contract negotiations are completed. **Any proposal received after the designated closing time will not be considered and will be returned unopened.** Sealed Proposals are due prior to the Proposal Deadline indicated above and must be marked Proposal for: **"KILL CREEK WRRF UV DISINFECTION & RECYCLED WATER PUMP SYSTEMS, PROJECT WW2001."**

No oral, telegraphic, facsimile or telephonic RFPs or RFP alterations or corrections will be considered.

Copies of RFP documents can be viewed or purchased for a Non-Refundable fee on-line at [www.drexeltch.com](http://www.drexeltch.com) in their eDistribution plan room, additional assistance is available at [distribution@drexeltch.com](mailto:distribution@drexeltch.com). Information regarding this project can be found in the "Public Jobs" link on the website. The Contract Documents for use in preparing proposals may also obtain a set of such documents from Drexel Technologies; 10840 West 86th Street, Lenexa, KS 66214, 913-371-4430.



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APPENDIX C – Original Recycle Water Pump Station Specifications



## PRE- PROPOSAL QUESTIONS

### KILL CREEK WATER RESOURCE RECOVERY FACILITY UV Disinfection and Recycled Water Systems Project WW2001

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All Manufacturers and/or Vendors are prohibited from contacting City officials, consultants, or staff, regarding this RFP between the time of issuance of the RFP and contract award, unless such contact is made through the City contacts specified below. Failure to comply with this provision could result in the rejection of a Manufacturer's and/or Vendor's proposal.

All questions regarding the proposal documents and proposal should be directed in writing via e-mail or posted mail to both contacts listed below.

Scott Millholland  
Kill Creek WRRF Superintendent  
[smillholland@gardnerkansas.gov](mailto:smillholland@gardnerkansas.gov)

Ric Gere  
Utilities Staff Engineer  
[rgere@gardnerkansas.gov](mailto:rgere@gardnerkansas.gov)

Pre-proposal questions will be accepted until **Monday, February 23, 2021 at 12:00 PM**



## Background Information and Scope

### Kill Creek WRRF UV Disinfection and Recycled Water Pump Systems WW2001

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#### A. Background Information

The City of Gardner is located in Johnson County, Kansas, at the southwestern edge of the Kansas City Metropolitan Area. The City has a current population of approximately 22,500 and has experienced rapid growth during the last fifteen years. The City owns and operates its own electric, water, and wastewater utility systems.

In June of 1990, the City installed a 27-MW simple cycle gas turbine facility for use during peak demand periods. In 2005, the City joined the Kansas Municipal Energy Agency (KMEA) as a participant and member of the Electric Management Program 1 (EMP1) to secure an adequate, economical and reliable supply of electricity. As a result, the City entered into Power Purchase Agreements (PPAs) to gain maximum benefits. In July of 2018, the City's energy usage was 16,681 MWh with a peak capacity of 37.1 MW. As of December 31, 2018, the City serves 8,288 residential, 536 commercial, and 8 industrial customers.

The City operates one water treatment plant. The Hillsdale Treatment Plant is located approximately 6.5 miles south of Gardner and uses the Hillsdale Reservoir as its raw water source. The Hillsdale Plant has a design capacity of 4.0 MGD. A 2.0 MGD expansion is currently being constructed.

Current water usage in the Gardner water distribution system averages about 2.1 million gallons per day (MGD), with a maximum daily production of approximately 3.20 MGD. In 2018, the peak daily production was 4.02 MGD due to a dry summer. The City of Gardner water distribution system, as of December 31, 2018, serves approximately 7,258 residential, 325 commercial, and 7 industrial customers. Additionally, the City of Gardner is a wholesale water supplier to Johnson County's New Century Air Center.

The City operates one wastewater treatment plant. The Kill Creek plant has a nominal capacity of 2.5 MGD and is designed to handle a peak capacity of 7.5 MGD. The City serves 6,847 residential, 229 commercial, and 7 industrial customers.

#### B. Project Overview

The City of Gardner is issuing this RFP to identify Vendor(s) that best addresses the replacement of existing Ultraviolet Disinfection equipment and the recycled water pump system at the Kill Creek Water Resource Recovery Facility. It is the intent to pre-select, secure the costs, and purchase from the Vendor(s) for the equipment to be installed by the Installation Contractor. The City will enter into additional contract with Installation Contractor for the removal of the existing equipment from service and replacement of equipment provided by Vendor(s).

The UV Disinfection Systems shall fully meet all the State of Kansas code requirements in addition to meeting all Federal and State regulatory permitting requirements. The current NPDES permit is included in **Appendix A**.

Vendor shall refer to **Appendices B** and **C** for the original specifications for the existing UV disinfection system and recycled water pump system. These specifications are to be used as reference of existing installed equipment and not requirements for proposed equipment systems being requested by the City.





## PROPOSAL REQUIREMENTS

### KILL CREEK WATER RESOURCE RECOVERY FACILITY UV Disinfection and Recycled Water Systems Project WW2001

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Vendor's Proposals shall include all the separate sections identified in the following Sections Requirements. Partial or incomplete submittals or submittals with responses in an order that does not match that presented in the Section Descriptions below may result in disqualification.

#### Section 1. Experience and Qualifications

Describe the experience and qualification of the Vendor to include:

1. Number of years the Vendor has been in business.
2. Number of years the Vendor has been in the business of disinfection of municipal wastewater with UV disinfection.
3. Listing of manufacturing facilities for equipment proposed for this project, the location of these manufacturing facilities, and years in operation.
4. Sales for the model of equipment proposed for the past five fiscal years.

#### Section 2. Description of Equipment Proposed

Describe, through use of technical drawings and technical literature, how the proposed equipment meets or exceeds the currently installed system requirements. The Vendor shall include a description of all auxiliary or support equipment and any warranties and services provided by Vendor.

The Vendor shall provide in summary of proposed equipment a general arrangement drawing for the City showing proposed layout for equipment systems, modules, AND ancillary equipment including ballast enclosures, power and light panels, HMI's, and any other control or electrical equipment recommended.

The following items shall be included but not limited in the equipment description summary and general arrangement drawings:

1. Model number of UV equipment,
2. System peak capacity in MGD,
3. Number of UV lamps,
4. Power consumption calculations for the proposed equipment,
5. Panel and enclosure dimensions,
6. Electrical room dimensions and enclosure spacing
7. Calculations demonstrating the proposed equipment provides the UV doses as required for disinfection.
8. Calculations showing head loss through UV modules under design peak flow conditions.

#### Section 3. Experience with Installed Equipment

Provide the following data on at least five similar installations by Vendor of the equipment type or model proposed with the following minimum information. At least five installations shall be located in the United States and shall have at minimum, the same number of lamps as proposed for the City and shall have been in service over two years. Additional installations may be submitted, and the equipment installed at the other referenced installations should be of similar size and in a similar application to that proposed for the Kill Creek Wastewater Resource Recovery Facility.

1. Plant Name/Location/Owner
2. Owner's current contact person and phone number
3. Date Installed or commissioned
4. Upstream treatment processes (i.e., primary, activated sludge, filtered, etc..)
5. Approximate hours run on equipment since installation
6. Disinfection performance obtained
7. Corrective maintenance history (warranty repairs, parts replaced under warranty, parts purchased from manufacturer after warranty)

#### Section 4. Preventive Maintenance Requirements

Provide a tabulation of preventive maintenance requirements that includes for each task:

1. Task description,
2. Frequency of task,
3. Estimated staff hours to perform the task,
4. Equipment, materials, and tools required to perform the task.

Tabulation should be from Manufacturer's standard literature.

#### Section 5. Service and Parts Facilities, and Service Staff

1. Provide if the service technicians full-time employees of the Vendor or contract services.
2. Provide the normal response time for on-site services from the time of order to the arrival of a service technician.
3. List the locations of the Manufacturer's service facilities in the United States.
4. List the parts-stocking warehouse locations in the United States.
  - i. Are all parts for the proposed equipment type or model available at these locations?
5. Provide the normal lead time for delivery of parts from time of order.
6. Provide a detailed list of spare parts included in the Vendor's proposal.
  - i. Include current list price for each spare part sold by Vendor.

#### Section 6. Schedule of Prices

1. Attach completely, "Schedule of Prices" for proposed equipment, included spare parts, and services provided in Vendor's proposal.
2. Provide a formal "Quotation" complete with a detailed scope of services and all terms and conditions suitable for giving to a bidding contractor for the installation construction contract. This shall include initial equipment costs, guaranteed power consumption at design average conditions, and guaranteed costs for replacement lamps, ballasts, and intensity sensors. Vendor shall guarantee purchase price for lamps, ballasts, and intensity sensors for **five (5)** years following the date of Substantial Completion of the equipment installation construction contract.
3. The Vendor is hereby notified that the "Schedule of Prices" will be made available to all bidding installation contractors who request them if the Vendor selected.

#### Section 7. Start-up and Training

1. Provide start-up and training plans including minimum number and duration of startup, testing, and training sessions and number of technicians per visit. Training plan should include description of training including methods of instruction and sample handouts, presentations or reference material.



## Proposal Timeline

### KCWRRF UV Disinfection and Recycled Water Systems WW2001

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#### A. Proposal Timeline

The following is the anticipated schedule of events:

RFP Released:	February 9, 2021
RFP Clarification Questions Due:	February 23, 2021
Clarification Answers Released:	February 24, 2021
RFP Response Due:	March 2, 2021
Utility Advisory Committee Meeting	March 4, 2021
Recommendation of award to Gardner City Council	March 15, 2021

KILL CREEK WATER RESOURCE RECOVERY FACILITY  
UV Disinfection and Recycled Water Systems  
Project WW2001

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**A. Proposal Evaluation**

A selection committee of a minimum of three personnel will be formed and shall be chaired by the Kill Creek WRRF Superintendent. The selection committee shall review the Proposals and provide a preliminary ranking of the Proposals according to the criteria contained in the RFP. If necessary, discussions, interviews or oral presentations by the top respondents will be scheduled.

The information in proposals is confidential during the evaluation process.

Final committee consensus of a recommended respondent will be made to the Gardner Utility Advisory Commission for recommendation to the City Council.

**B. Consideration Criteria**

To be considered, the Supplier must demonstrate through their Proposal that:

1. the Supplier and/or its parent company is an established, financially stable, ongoing business,
2. the Supplier has fully investigated the existing equipment installation and evaluated the site for all necessary parameters and any constraints that may exist for the proper application of the proposed equipment,
3. the equipment model proposed by Supplier complies with all requirements and will meet any and all State and Federal requirements,
4. the equipment proposed has demonstrated successful service for minimum of two years in at least five installations in the United States,
5. the equipment proposed requires an acceptable level of preventative maintenance,
6. the Supplier demonstrated readily available service staff and facilities for all parts of proposed equipment can be obtained and/or repaired.

KILL CREEK WATER RESOURCE RECOVERY FACILITY  
UV Disinfection and Recycled Water Systems  
Project WW2001

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**C. Evaluation Criteria**

The selection committee will review and rank the submitted Proposals. If interviews are required to assist in the selection process, the short listed Suppliers will be notified. The evaluation criteria used for selection shall be based on the following scoring criteria:

<b>EVALUATION SCORING</b> <b>Kill Creek Water Resource Recovery Facility</b> <b>UV Disinfection and Non-Potable Wash Systems</b>	
<b>Evaluation Category</b>	<b>Maximum Points</b>
Qualifications	15
Meeting System / Technical Requirements	30
Project Schedule	10
Scope of Services and Parts Availability	30
Project Price / Life Cycle Cost	15
<b>Maximum Total Points</b>	<b>100</b>

**D. Acceptance and Award**

The City reserves the right to waive all formalities and minor defects, and/or reject any and all RFPs in whole or in part with or without cause, and/or to accept the RFP that in its judgment will be in the best interest of the City irrespective of cost.

The City reserves the right to further negotiate details of the proposed contract with respondent to reach a contract that is mutually beneficial and meets the project needs, schedule, and budget of the City.

## **APPENDIX A**

### **Kill Creek Water Resource Recovery Facility Pollution Permit**

Bureau of Water  
1000 SW Jackson St., Suite 420  
Topeka, KS 66612-1367



Phone: 785-296-5504  
Fax: 785-296-0086  
jgaggero@kdheks.gov  
www.kdheks.gov

Susan Mosier, MD, Secretary

Department of Health & Environment

Sam Brownback, Governor

October 24, 2016

City Clerk  
Scott Millholland  
120 East Main  
Gardner, KS 66030

RE: Kansas Water Pollution Control  
Permit No. M-KS20-0001  
Gardner, City of

Dear Permittee:

You have fulfilled all the filing requirements for a Kansas Water Pollution Control Permit and Authorization to Discharge under the National Pollutant Discharge Elimination System (NPDES). We are pleased to forward your new permit. While it is permissible to make as many copies as needed for monitoring and reporting purposes, you need to retain the original permit for your files.

We suggest you carefully read the terms and conditions of your permit and understand these terms and conditions are enforceable under both State and Federal law. Also, please notice the reporting paragraph on page 2 of your permit, where all reports are due by the 28<sup>th</sup> day of the schedule noted.

KDHE will be contacting you to assist you in signing into our new electronic discharge monitoring report (eDMR) tool. Recently, EPA promulgated a new rule requiring all discharge monitoring reports to be transmitted to the state agencies via electronic means. KDHE has developed an electronic discharge monitoring report (eDMR) tool that will help you comply with the EPA requirement. To access this tool, you will first need to sign into the KEAP (Kansas Environmental Application Portal) and get the appropriate authorizations, user ID and password as discussed in the instructions to be provided.

If you have any questions concerning this permit, contact Shelly Shores-Miller at 785.296.2856. For questions concerning the eDMR tool, contact Debbie Mildfelt at 785.296.5561 or dmildfelt@kdheks.gov.

Sincerely,

Jaime Gaggero  
Director, Bureau of Water

pc: NE - District  
RG- Permit File  
DLM - eDMR

KANSAS WATER POLLUTION CONTROL PERMIT AND  
AUTHORIZATION TO DISCHARGE UNDER  
THE NATIONAL POLLUTANT DISCHARGE  
ELIMINATION SYSTEM

Pursuant to the Provisions of Kansas Statutes Annotated 65-164 and 65-165, the Federal Water Pollution Control Act as amended, (33 U.S.C. 1251 et seq; the "Act"),

Owner: Gardner, City of

Owner's Address: 120 East Main  
Gardner, Kansas 66030

Facility Name: Gardner (Kill Creek) Wastewater Treatment Facility

Facility Location: 32101 W. 159<sup>th</sup> Street  
Gardner, Kansas 66030  
NE<sup>1</sup>/<sub>4</sub>, NW<sup>1</sup>/<sub>4</sub>, Section 15, Township 14S, Range 22E  
Johnson County, Kansas  
Latitude: 38.8381, Longitude: -94.95757

Outfall: Latitude: 38.83756, Longitude: -94.95625

Receiving Stream: Kansas River via Kill Creek  
Basin: Kansas River Basin

is authorized to discharge from the wastewater treatment facility described herein, in accordance with effluent limits and monitoring requirements as set forth herein.

This permit is effective December 1, 2016, supersedes the previously issued water pollution control permit M-KS20-0001, and expires October 31, 2021.

FACILITY DESCRIPTION:

1. Lift Station
2. Two Step Screens
3. Grit Removal
4. Activated Sludge Process
5. Final Clarification
6. Ultraviolet Disinfection
7. Cascade Aeration
8. Aerobic Sludge Storage
9. Belt Press
10. Effluent Irrigation of Public Use Ball Fields/Parks
11. Average Daily Flow = 2.5 MGD



Secretary, Kansas Department of Health and Environment

October 20, 2016  
Date



**A. EFFLUENT LIMITS AND MONITORING REQUIREMENTS**

The permittee is authorized to discharge from outfall(s) with serial number(s) as specified in this permit. The limits shall become effective on the dates specified herein. Such discharges shall be controlled, limited, and monitored by the permittee as specified. There shall be no discharge of floating solids or visible foam in other than trace amounts.

Monitoring reports shall be submitted on or before the 28th day of the following month. In the event no discharge occurs, written notification is still required.

Parameter	Final Limits	Measurement Frequency	Sample Type
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Monitoring Location 001ZG (EDMR code: INF001ZG) - Influent Flow to the Treatment Plant

Flow to Plant - MGD	Monitor	Daily*	Flow Meter Or Calculate
Biochemical Oxygen Demand (5-Day)-mg/l	Monitor	Twice Monthly	24-Hour Composite
Total Suspended Solids-mg/l	Monitor	Twice Monthly	24-Hour Composite
Total Phosphorus (as P)-mg/l	Monitor	Once Monthly	24-Hour Composite
Total Kjeldahl Nitrogen (as N)-mg/l	Monitor	Once Monthly	24-Hour Composite

Outfall 001A1 (EDMR code: EFF001A1)- Effluent at effluent sampling point near the bottom of the cascade

Biochemical Oxygen Demand (5-Day)**		Twice Monthly	24-Hour Composite
<b>May thru September</b>			
Weekly Average-mg/l	30		
Monthly Average-mg/l	20		
<b>March, April, October, and November</b>			
Weekly Average-mg/l	40		
Monthly Average-mg/l	25		
<b>December thru February</b>			
Weekly Average-mg/l	45		
Monthly Average-mg/l	30		
Total Suspended Solids*		Twice Monthly	24-Hour Composite
Weekly Average-mg/l	45		
Monthly Average-mg/l	30		

A. EFFLUENT LIMITS AND MONITORING REQUIREMENTS (continued)

Ammonia Nitrogen (as N)-mg/l		Twice Monthly	24-Hour Composite
January, February and December			
Daily Maximum	8.6		
Monthly Average	4.9		
March, April, and October			
Daily Maximum	8.6		
Monthly Average	3.0		
May			
Daily Maximum	8.6		
Monthly Average	2.5		
June and September			
Daily Maximum	8.6		
Monthly Average	1.9		
July and August			
Daily Maximum	8.6		
Monthly Average	1.4		
November			
Daily Maximum	8.6		
Monthly Average	4.1		
E.coli - Colonies/100ml		Twice Monthly	Grab
April 1 through October 31			
Weekly Geometric Average	4348		
Monthly Geometric Average	262		
November 1 through March 31			
Monthly Geometric Average	2358		
pH - Standard Units	6.0 - 9.0	Twice Monthly	Grab
Dissolved Oxygen-mg/l	Monitor	Daily	Grab
Total Phosphorus (as P)-mg/l	Monitor	Once Monthly	24-Hour Composite
Total Phosphorus (as P)-lbs/day	Calculate	Once Monthly	Calculate
Nitrate (NO3) + Nitrite (NO2) as N-mg/l***	Monitor	Once Monthly	24-Hour Composite
Total Kjeldahl Nitrogen (TKN) as N-mg/l***	Monitor	Once Monthly	24-Hour Composite
Total Nitrogen as N - mg/l*** (TKN + NO3 + NO2)	Calculate	Once Monthly	Calculate
Total Nitrogen (as N)-lbs/day (TKN + NO3 + NO2)	Calculate	Once Monthly	Calculate
Flow to Stream - MGD	Calculate	Daily	Calculate
Whole Effluent Toxicity Test	See Supplemental Condition #2		
Priority Pollutant Scan	See Supplemental Condition #3		

A. EFFLUENT LIMITS AND MONITORING REQUIREMENTS (Continued)

Internal Monitoring Location 002A1 (EDMR Code BFHP002A1) - Treated Effluent to Irrigation Holding Pond

Monitoring and testing of the treated wastewater must be conducted for any calendar month during which effluent is pumped to the irrigation holding pond.

Flow - MGD	Monitor	Daily	Flow Meter
E.coli - Colonies/100 ml			
Monthly Geometric Average	262	Twice Monthly	Grab

\* Flow to Plant = Flow to Stream + Flow to Irrigation Holding Pond

\*\* Minimum removal of 85% required for Biochemical Oxygen Demand (5-Day) and Total Suspended Solids.

\*\*\* Permittee shall sample for these tests on the same day and calculate the total nitrogen only when both test values are available. The Minimum Reportable Limit (MRL) for TKN is 1 mg/l and for nitrate + nitrite is 0.1 mg/l. Values less than the MRL shall be reported using the less than sign (<) with the MRL value but for purposes of calculating and reporting the total nitrogen result, less than values shall be defaulted to zero.

B. STANDARD CONDITIONS

In addition to the specified conditions stated herein, the permittee shall comply with the attached Standard Conditions dated June 20, 2016.

C. SPECIAL CONDITIONS

This wastewater treatment facility is NOT designed and built to provide for nutrient removal. However, the permittee will operate the treatment facility to maximize the level of nutrient removal with the intent of achieving either of the following goals as annual average target effluent levels from the mechanical plant:

	Goal 1	Goal 2
1. Total Nitrogen (as N) - mg/l	10.0	8.0
2. Total Phosphorus (as P)- mg/l	1.0	1.5

These target values are not to be considered as effluent limits for this permit. KDHE reserves the right to reopen this permit to impose limits for nutrients pursuant to Kansas law when such criteria are adopted in the Kansas Surface Water Quality Standards.

D. SLUDGE USE AND DISPOSAL

Sludge disposal shall be in accordance with the 40 CFR Part 503 Sludge Regulations.

E. SCHEDULE OF COMPLIANCE

None

F. SUPPLEMENTAL CONDITIONS

1. PARK/BALL FIELD IRRIGATION:

The following management and monitoring requirements apply for treated wastewater from the Kill Creek Wastewater Treatment Facility utilized for irrigation purposes at the park (baseball/softball fields and soccer fields). Monitoring and testing of the treated wastewater must be conducted for any calendar month during which effluent is pumped to the irrigation holding ponds. The monitoring and effluent limits are addressed in Section A above.

- a. Irrigation using wastewater effluent shall occur only at times when public access to the irrigated area is restricted.
- b. Irrigation of crops produced for direct human consumption shall be prohibited.
- c. Irrigation shall be limited in such a manner as to avoid runoff of effluent to adjacent landowners.
- d. Irrigation shall be conducted in such a manner as to prevent ponding of treated wastewater on the ground surface.
- e. Irrigation spray shall not be allowed to fall or drift on areas used for picnicking, public drinking fountains, potable water hose bibs, private residences or any other areas where food or drink is routinely prepared or served.
- f. Signs bearing the following warning must be posted around any treated wastewater holding pond: RECLAIMED WASTEWATER DO NOT DRINK OR SWIM.
- g. Signs bearing the following warning must be posted at any hose bibbs which can discharge treated wastewater: RECLAIMED WASTEWATER DO NOT DRINK.
- h. Cross-connections between treated wastewater water lines and potable water supply lines are prohibited.
- i. For parks, ball fields, cemeteries, recreational areas, etc., signs shall be placed at the entrance or other suitable conspicuous places indicating the area is irrigated with treated wastewater.
- j. All monitoring of the treated wastewater shall be conducted using EPA approved methods and KDHE certified laboratories if applicable.
- k. The results of the analyses shall be reported in conjunction with the monthly discharge monitoring reports.
- l. Maintenance repairs to the system may be tested at any time provided public access to the irrigated area is restricted and the system operator (or maintenance personnel) is present at the irrigated site during the entire test.

2. Whole Effluent Toxicity Testing:

- a. Chronic Whole Effluent Toxicity (WET) testing on a 24-hr composite sample of the effluent shall be conducted once in calendar year 2012 and annually thereafter. The 25% Inhibition Concentration, IC25, shall be equal to or greater than 79% effluent. Test results less than 79% are violations of this permit. The test procedures shall use the 7-day short term 3-sample daily static renewal test method in accordance with the EPA document, Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, fourth edition, October 2002 using test organisms *Pimephales promelas* (fathead minnow) and *Ceriodaphnia dubia* (water flea) within a dilution series containing 0%, 12.5%, 25%, 50%, 79%, and 100% effluent. KDHE reserves the right to increase or decrease testing frequency based upon compliance history and toxicity testing results.

- b. If the WET test results indicate the IC25 is equal to or greater than 79% effluent, the effluent has passed the toxicity test and a copy of the test report shall be due with the next scheduled Discharge Monitoring Report.
- c. If the WET test results indicate the IC25 is less than 79% effluent, the effluent has failed the toxicity test and the permittee shall immediately notify KDHE by telephone at (785) 296-5517 and submit to KDHE a copy of the test report within five days of receipt of the information. KDHE reserves the right to require the permittee to take such actions as are reasonable to identify and remedy any identified or predicted toxic conditions in the receiving stream outside of the mixing zone which is caused by the permittee's effluent.
- d. Permittee shall also test a portion of the same effluent sample used for the WET test for the following substances (required minimum reportable detection levels are in parenthesis):

Antimony (10 µg/L)*	Nickel (10 µg/L)*
Arsenic (10 µg/L)*	Selenium (5 µg/L)*
Beryllium (5 µg/L)*	Silver (2 µg/L)*
Cadmium (2 µg/L)*	Thallium (10 µg/L)*
Chromium (10 µg/L)*	Zinc (20 µg/L)*
Copper (10 µg/L)*	Ammonia as N (0.2 mg/L)
Lead (5 µg/L)*	Total Hardness as CaCO <sub>3</sub> mg/L
Mercury (0.2 µg/L-Cold Vapor Method)	pH

\* Parameter shall be tested and reported as Atotal recoverable@ metals.

- e. The permittee shall coordinate sampling for this test with other requirements of this permit. The permittee shall use a laboratory approved by KDHE for Whole Effluent Toxicity testing.

### 3. Priority Pollutant Scan:

Permittee shall conduct a Priority Pollutant Scan on the effluent for the parameters listed in Table I: Priority Pollutant Scan on the following pages. The Priority Pollutant Scan shall be conducted within 18 months of the expiration date of this permit and the results reported to KDHE prior to 6 months of the expiration date of this permit.

Sample type shall be 24-hour composite except for Volatile Organic Compounds which shall be a grab sample.

See Supplemental Condition F.2.d. for minimum detection limits for certain metals in the Priority Pollutant Scan.

### G. ADDITIONAL INFORMATION

EPA has promulgated a final rule requiring regulated entities to report DMR data electronically by December 21, 2016. Also, KAR 28-16-63 requires permittees to report NPDES data in a form required by KDHE. KDHE has developed electronic reporting tools to assist permittees in complying with the EPA electronic reporting rule and KAR 28-61-63. Unless a waiver has been approved by KDHE, permittees are required to submit reports electronically when these tools are made available to them by KDHE.

**Table I - Priority Pollutant Scan\***

<u>Metals (µg/l)</u>	<u>Base/Neutral (µg/l)</u>	<u>Acid Compounds (µg/l)</u>
Total Antimony	Acenaphthene	2-chlorophenol
Total Beryllium	Acenaphthylene	2,4-dichlorophenol
Total Cadmium	Anthracene	2,4-dimethylphenol
Total Chromium	Benzidine	2,4-dinitrophenol
Total Copper	Benzo(a) anthracene	2-nitrophenol
Total Lead	Benzo(a)pyrene	4-nitrophenol
Total Mercury	Benzo(k)fluoranthene	Parachlorometa cresol
Total Nickel	Benzo (ghi) perylene	Pentachlorophenol
Total Selenium	Benzo (b) fluoranthene	Phenol
Total Silver	Bis(2-chloroethoxy)methane	4,6-dinitro-o-cresol
Total Thallium	Bis(2-chloroethyl)ether	2,4,6-trichlorophenol
Total Zinc	Bis(2-ethylhexyl)phthalate	
	Bis(2-chloroisopropyl) ether	
	1,2-diphenylhydrazine	
	Fluoranthene	
	Fluorene	
	Nitrobenzene	
	N-nitrosodimethylamine	
	N-nitrosodi-n-propylamine	
	N-nitrosodiphenylamine	
	Phenanthrene	
	Pyrene	
	1,2,4-trichlorobenzene	
	4-bromophenyl phenyl ether	
	Butyl benzyl phthalate	
	2-chloronaphthalene	
	4-chlorophenyl phenyl ether	
	Chrysene	
	Dibenzo(a,h) anthracene	
	1,2-dichlorobenzene	
	1,3-dichlorobenzene	
	1,4-dichlorobenzene	
	3,3-dichlorobenzidine	
	Dimethyl phthalate	
	Diethyl phthalate	
	Di-n-butyl phthalate	
	2,4-dinitrotoluene	
	2,6-dinitrotoluene	
	Di-n-octyl phthalate	
	Hexachlorobenzene	
	Hexachlorobutadiene	
	Hexachlorocyclopentadiene	
	Hexachloroethane	
	Indeno (1,2,3-cd) pyrene	
	Naphthalene	
	Isophorone	
		<u>Volatiles (µg/l)</u>
		Acrolein
		Acrylonitrile
		Benzene
		Bromoform
		Carbon Tetrachloride
		Chlorobenzene
		Chlorodibromomethane
		Chloroethane
		2-chloroethylvinyl ether
		Chloroform
		Dichlorobromomethane
		1,1-dichloroethane
		1,2-dichloroethane
		1,1-dichloroethylene
		1,2-dichloropropane
		1,3-dichloropropylene
		Ethylbenzene
		Methyl bromide
		Methyl chloride
		Methylene chloride
		1,1,2,2-tetrachloroethane
		Tetrachloroethylene
		Toluene
		1,2 trans-dichloroethylene
		1,1,1-trichloroethane
		1,1,2-trichloroethane
		Trichloroethylene
		Vinyl chloride
		<u>Miscellaneous</u>
		Total Cyanide (mg/l)***
		Asbestos (ent/l)
		2,3,7,8-TCDD (Dioxin) (µg/l)
<u>Pesticides (µg/l)</u>		
Aldrin		
Alpha-BHC**		
Beta-BHC**		
Gamma-BHC**		
Delta-BHC**		
Chlordane		
4,4-DDT		
4,4-DDD		
4,4-DDE		
Dieldrin		
Alpha-endosulfan		
Beta-endosulfan		
Endosulfan sulfate		
Endrin		
Endrin aldehyde		
Heptachlor		
Heptachlor epoxide		
Toxaphene		
<u>Polychlorinated Biphenyls (µg/l)</u>		
PCB-1242		
PCB-1254		
PCB-1221		
PCB-1232		
PCB-1248		
PCB-1260		
PCB-1016		

\* Testing not required for pollutants with a strike-through.

\*\* Scientific name is hexachlorocyclohexane

\*\*\* The total cyanide analysis must include preliminary treatment of the sample to avoid NO<sub>2</sub><sup>-</sup> interference. See Standard Methods for the Examination of Water and Wastewater, 22nd Edition, 4500-CN<sup>-</sup> B. Preliminary Treatment of Samples.

## STANDARD CONDITIONS FOR

### KANSAS WATER POLLUTION CONTROL AND NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMITS

#### 1. Representative Sampling and Discharge Monitoring Report Submittals:

- A. Samples and measurements taken as required herein shall be representative of the quality and quantity of the monitored discharge. Test results shall be recorded for the day the samples were taken. If sampling for a parameter was conducted across more than one calendar day, the test results may be recorded for the day sampling was started or ended. All samples shall be taken at the locations designated in this permit, and unless specified, at the outfall/monitoring location(s) before the wastewater joins or is diluted by any other water or substance.
- B. Monitoring results shall be recorded and reported on forms acceptable to the Division and submitted no later than the 28th day of the month following the completed reporting period. Signed and certified copies of other reports, required herein, prepared in accordance with KAR 28-16-59, may be faxed to 785.296.0086, e-mailed as scanned attachments to [dmr4kdhe@kdheks.gov](mailto:dmr4kdhe@kdheks.gov), or sent by U.S. mail to:

Kansas Department of Health & Environment  
Bureau of Water-Technical Services Section  
1000 SW Jackson Street, Suite 420  
Topeka, KS 66612-1367

#### 2. Definitions:

- A. Unless otherwise specifically defined in this permit, the following definitions apply:
1. The "Daily Maximum" is the total discharge by weight or average concentration, measurement taken, or value calculated during a 24-hour period. The parameter, pH, is limited as a range between and including the values shown.
  2. The "Weekly Average" is the arithmetic mean of the value of test results from samples collected, measurements taken or values calculated during four monitoring periods in each month consisting of calendar days 1-7, 8-14, 15-21 and 22 through the end of the month.
  3. The "Monthly Average", other than for E. coli bacteria, is the arithmetic mean of the value of test results from samples collected, measurements taken or values calculated during a calendar month. The monthly average is determined by the summation of all calculated values or measured test results divided by the number of calculated values or test results reported for that parameter during the calendar month. The monthly average for E. coli bacteria is the geometric average of the value of the test results from samples collected in a calendar month. The geometric average can be calculated by using a scientific calculator to multiply all the E. coli test results together and then taking the nth root of the product where n is the number of test results. Non-detect values shall be reported using the less than symbol (<) and the minimum detection or reportable value. To calculate average values, non-detects shall be defaulted to zero (or one for geometric averages). Greater than values shall be reported using the greater than symbol (>) and the reported value. To calculate average values, the greater than reported value shall be used in the averaging calculation.
- B. A "grab sample" is an individual sample collected in less than 15 minutes. A "composite sample" is a combination of individual samples in which the volume of each individual sample is proportional to the flow, or the sample frequency is proportioned to the flow rate over the sample period, or the sample frequency is proportional to time.
- C. The terms "Director", "Division", and "Department" refer to the Director, Division of Environment, Kansas Department of Health and Environment, respectively.
- D. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of an in-plant diversion. Severe property damage does not mean economic loss caused by delays in production.
- E. "Bypass" means the intentional diversion of waste streams from any portion of the treatment facility.

3. **Schedule of Compliance:** No later than 14 calendar days following each date identified in the "Schedule of Compliance," the permittee shall submit via mail, e-mail or fax per paragraph 1.B above, either a report of progress or, in the case of specific action being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirements, or, if there are no more scheduled requirements, when such noncompliance will be corrected.
4. **Test Procedures:** All analyses required by this permit shall conform to the requirements of 40 CFR Part 136, unless otherwise specified, and shall be conducted in a laboratory accredited by the Department. For each measurement or sample, the permittee shall record the exact place, date, and time of measuring/sampling; the date and time of the analyses, the analytical techniques or methods used, minimum detection or reportable level, and the individual(s) who performed the measuring/sampling and analysis and, the results. If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved procedures, the results shall be included in the Discharge Monitoring Report form required in 1.B. above. Such increased frequencies shall also be indicated.
5. **Change in Discharge:** All discharges authorized herein shall be consistent with the permit requirements. The discharge of any pollutant not authorized by this permit or of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of this permit. Any anticipated facility expansions, production or flow increases, or production or wastewater treatment system modifications which result in a new, different, or increased discharge of pollutants shall be reported to the Division at least one hundred eighty (180) days before such change.
6. **Facilities Operation:** The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the requirements of this permit and Kansas and Federal law. Proper operation and maintenance also include adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the requirements of this permit. The permittee shall take all necessary steps to minimize or prevent any adverse impact to human health or the environment resulting from noncompliance with any effluent limits specified in this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge. When necessary to maintain compliance with the permit requirements, the permittee shall halt or reduce those activities under its control which generate wastewater routed to this facility.
7. **Incidents:**

"Collection System Diversion" means the diversion of wastewater from any portion of the collection system.

"In-Plant Diversion" means routing the wastewater around any treatment unit in the treatment facility through which it would normally flow.

"In-Plant Flow Through" means an incident in which the wastewater continues to be routed through the equipment even though full treatment is not being accomplished because of equipment failure for any reason.

"Spill" means any discharge of wastewater, sludge or other materials from the treatment facility other than effluent or as more specifically described by other "Incidents" terms.

"Upset" means an exceptional incident in which there is unintentional and temporary noncompliance or anticipated noncompliance with permit effluent limits because of factors beyond the reasonable control of the permittee, as described by 40 C.F.R. 122.41(n).
8. **Diversions not Exceeding Limits:** The permittee may allow any diversion to occur which does not cause effluent limits to be exceeded, but only if it also is for essential maintenance to assure efficient operation. Such diversions are not subject to the Incident Reporting requirements shown below.
9. **Prohibition of an In-Plant Diversion:** Any in-plant diversion from facilities necessary to maintain compliance with this permit is prohibited, except: (a) where the in-plant diversion was unavoidable to prevent loss of life, personal injury, or severe property damage; (b) where there were no feasible alternatives to the in-plant diversion, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime and (c) the permittee submitted a notice as required in the Incident Reporting paragraph below. The Director may approve an anticipated in-plant diversion, after considering its adverse effects, if the Director determines that it will meet the three conditions listed above.



10. **Incident Reporting:** The permittee shall report any unanticipated collection system diversion, in-plant diversion, in-plant flow through occurrences, spill, upset or any violation of a permitted daily maximum limit within 24 hours from the time the permittee became aware of the incident. A written submission shall be provided within 5 days of the time the permittee became aware of the incident. The written submission shall contain a description of the noncompliance and its cause, the period of noncompliance, including exact dates and times; and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance. An Incident Report form is available at [www.kdheks.gov/water/tech.html](http://www.kdheks.gov/water/tech.html).
- For an anticipated incident or any planned changes or activities in the permitted facility that may result in noncompliance with the permit requirements, the permittee shall submit written notice, if possible, at least ten days before the date of the event.
- For other noncompliance, the above information shall be provided with the next Discharge Monitoring Report.
11. **Removed Substances:** Solids, sludges, filter backwash, or other pollutants removed in the course of treatment of water shall be utilized or disposed of in a manner acceptable to the Division.
12. **Power Failures:** The permittee shall provide an alternative power source sufficient to operate the wastewater control facilities or otherwise control pollution and all discharges upon the loss of the primary source of power to the wastewater control facilities.
13. **Right of Entry:** The permittee shall allow authorized representatives of the Division of Environment or the Environmental Protection Agency upon the presentation of credentials, to enter upon the permittee's premises where an effluent source is located, or in which are located any records required by this permit, and at reasonable times, to have access to and copy any records required by this permit, to inspect any facilities, monitoring equipment or monitoring method required in this permit, and to sample any influents to, discharges from or materials in the wastewater facilities.
14. **Transfer of Ownership:** The permittee shall notify the succeeding owner or controlling person of the existence of this permit by certified letter, a copy of which shall be forwarded to the Division. The succeeding owner shall secure a new permit. This permit is not transferable to any person except after notice and approval by the Director. The Director may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary.
15. **Records Retention:** Unless otherwise specified, all records and information resulting from the monitoring activities required by this permit, including all records of analyses and calibration and maintenance of instruments and recordings from continuous monitoring instruments, shall be retained for a minimum of 3 years, or longer if requested by the Division. Biosolids/sludge records and information are required to be kept for a minimum of 5 years, or longer if requested by the Division. Groundwater monitoring data, including background samples results, shall be kept for the life of the facility regardless of ownership.
16. **Availability of Records:** Except for data determined to be confidential under 33 USC Section 1318, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Department. Effluent data shall not be considered confidential. Knowingly making any false statement on any such report or tampering with equipment to falsify data may result in the imposition of criminal penalties as provided for in 33 USC Section 1319 and KSA 65-170c.
17. **Permit Modifications and Terminations:** As provided by KAR 28-16-62, after notice and opportunity for a hearing, this permit may be modified, suspended or revoked or terminated in whole or in part during its term for cause as provided, but not limited to those set forth in KAR 28-16-62 and KAR 28-16-28b through g. The permittee shall furnish to the Director, within a reasonable amount of time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The permittee shall also furnish upon request, copies of all records required to be kept by this permit. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.
18. **Toxic Pollutants:** Notwithstanding paragraph 17 above, if a toxic effluent standard or prohibition (including any schedule of compliance specified at such effluent standards) is established under 33 USC Section 1317(a) for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition. Nothing in this permit relieves the permittee from complying with federal toxic effluent standards as promulgated pursuant to 33 USC Section 1317.
19. **Administrative, Civil and Criminal Liability:** The permittee shall comply with all requirements of this permit. Except as authorized in paragraph 9 above, nothing in this permit shall be construed to relieve the permittee from administrative, civil or criminal penalties for noncompliance as provided for in KSA 65-161 et seq., and 33 USC Section 1319.

20. **Oil and Hazardous Substance Liability:** Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities or penalties to which the permittee is or may be subject to under 33 USC Section 1321 or KSA 65-164 et seq. A municipal permittee shall promptly notify the Division by telephone upon discovering crude oil or any petroleum derivative in its sewer system or wastewater treatment facilities.
21. **Industrial Users:** A municipal permittee shall require any industrial user of the treatment works to comply with 33 USC Section 1317, 1318 and any industrial user of storm sewers to comply with 33 USC Section 1308.
22. **Property Rights:** The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights nor any infringements of or violation of federal, state or local laws or regulations.
23. **Operator Certification:** The permittee shall, if required, ensure the wastewater facilities are under the supervision of an operator certified by the Department. If the permittee does not have a certified operator or loses its certified operator, appropriate steps shall be taken to obtain a certified operator as required by KAR 28-16-30 et seq.
24. **Severability:** The provisions of this permit are severable. If any provision of this permit or any circumstance is held invalid, the application of such provision to other circumstances and the remainder of the permit shall not be affected thereby.
25. **Removal from Service:** The permittee shall inform the Division at least three months before a pumping station, treatment unit, or any other part of the treatment facility permitted by this permit is to be removed from service and shall make arrangements acceptable to the Division to decommission the facility or part of the facility being removed from service such that the public health and waters of the state are protected.
26. **Duty to Reapply:** A permit holder wishing to continue any activity regulated by this permit after the expiration date, must apply for a new permit at least 180 days prior to expiration of the permit.

## **APPENDIX B**

### **Kill Creek Water Resource Recovery Facility Original UV Disinfection Specifications**

## SECTION 11400 - CLOSED CHANNEL ULTRAVIOLET DISINFECTION SYSTEM

### PART 1 - GENERAL

#### 1.1 DEFINITIONS

A. The definitions listed below pertain to this technical specification and do not alter any definitions provided in other technical specifications.

1. The OWNER is the City of Gardner, Kansas.
2. The PROJECT is the Kill Creek Wastewater Treatment Plant.
3. The SITE is Gardner, Kansas.
4. The ENGINEER is George Butler Associates, Inc.
5. The SUPPLIER is Aquionics, Inc., P.O. Box 18395, Erlanger, KY 41018.

1.2 The CONTRACTOR is the firm contractually bound to the OWNER for providing and installing equipment and materials for the PROJECT specified in project documents.

#### 1.3 WORK INCLUDED

- A. The CONTRACTOR shall furnish and install a complete high intensity medium pressure ultraviolet disinfection system as described in this specification and as shown on the drawings. The CONTRACTOR shall be responsible for equipment installation per directions of the SUPPLIER. The SUPPLIER will be responsible for verification of system installation, start-up, testing, and operation and maintenance training of the OWNER's personnel.
- B. The SUPPLIER shall guarantee that the system shall be capable of disinfecting an maximum effluent flow of 9 MGD as described in the water characteristics in Section 2.03 OPERATING PARAMETERS., to reduce fecal coliform levels to a maximum of 200 CFU/100mL. The system shall consist of two parallel operating units each capable of treating 4.5 MGD.

### PART 2 - MATERIALS

#### 2.1 GENERAL

- A. The CONTRACTOR shall furnish and install a complete high intensity, medium pressure disinfection system as described herein. The system shall include, but is not limited to, a stainless steel disinfection chamber, groups of medium pressure, high intensity UV lamps, and power/control cabinets. The CONTRACTOR shall physically install the disinfection chamber, and power/control cabinets according to the Manufacturer's directions and drawings. The CONTRACTOR shall provide the power source, electrical conduit, power supply and control conductors to the power/control cabinets, and equipment base supports. The CONTRACTOR shall provide electrical conduit between

the power/control cabinets and UV units. The Supplier shall provide, install and terminate all interconnecting cables between the power/control cabinets and the UV units, and shall also be responsible for verification of installation including electrical hookup of equipment, start-up, and testing.

B. TRAINING

The CONTRACTOR shall be responsible for all costs for providing SUPPLIER's representative training for the OWNER's operation personnel.

2.2 ACCEPTABLE SUPPLIER

- A. Only companies with a minimum of five years experience and history of successful installations of medium pressure, high intensity UV systems will be considered. Preference will be given to those systems that can clearly demonstrate applied experience for comparable applications. Pre-approved equipment supplier is Aquionics, Inc., P.O. Box 18395, Erlanger, KY 41018.

2.3 OPERATING PARAMETERS

Effluent parameters:

Fluid Evaluation: 60 % transmission in a 1 cm quartz cell @ 254 nm.

BOD(5Day):30mgn

Total Suspended Solids: 30 mg/l

Fecal Coliform Count: 200/100 ml

Maximum Flow Rate: 3 1 25 gpm

Minimum Water Temperature: 32 deg F

Maximum Water Temperature: 113 deg F

Maximum Allowable Head Loss Through Chamber: 18"(@ Maximum Flow)

Minimum UV Dose: 25 mJ/cm<sup>2</sup> (at the end of lamp life)

End of lamp life shall be defined to be when UV output of the lamp has decrease by 30%. Minimum lamp life shall be 2000 hours if continuously operated at power level 3 and 8000 hours if continuously operated at power level 1.

*Specification Section 11400, Closed Channel Ultraviolet Disinfection System:*

- a) *Section 2.3, Operating Parameters:*

*Delete:*

*Effluent parameters:*

*Fluid Evaluation: 60% transmission in a 1 cm quartz cell @ 254 nm.*

*BOD(5Day):30mgn*

*Total Suspended Solids: 30 mg/l*

*Fecal Coliform Count: 200/100 ml*

*Maximum Flow Rate: 3 1 25 gpm*

*Minimum Water Temperature: 32 deg F*

*Maximum Water Temperature: 113 deg F*

*Maximum Allowable Head Loss Through Chamber: 18"(@ Maximum Flow)  
Minimum UV Dose: 25 mJ/cm<sup>2</sup> (at the end of lamp life)*

*End of lamp life shall be defined to be when UV output of the lamp has decrease by 30%. Minimum lamp life shall be 2000 hours if continuously operated at power level 3 and 8000 hours if continuously operated at power level 1.*

*Add:*

*Effluent parameters:*

*Fluid Evaluation: 62 % transmission in a 1 cm quartz cell @ 254 nm.*

*BOD(5Day):30mgn*

*Total Suspended Solids: Less than 10 mg/1*

*Fecal Coliform Count: 200/100 ml*

*Maximum Flow Rate: 3 1 25 gpm*

*Minimum Water Temperature: 32 deg F*

*Maximum Water Temperature: 113 deg F*

*Maximum Allowable Head Loss Through Chamber: 18"(@ Maximum Flow)*

*Minimum UV Dose: 25 mJ/cm<sup>2</sup> (at the end of lamp life)*

*Lamp life shall be guaranteed for 8000 hours on a pro-rated basis. End of lamp life shall be defined to be when UV output of the lamp has decreased by 30%.*

## 2.4 ULTRAVIOLET DISINFECTION CHANNEL

### A. Disinfection Chambers

There shall be two (2) Disinfection Channels, each provided with a UV unit with each designed to accept three (3) clusters of four (4) lamps. Initially two (2) clusters (total of eight (8) medium pressure high intensity lamps) shall be operational with the third blank cluster left available for future expansion. Units shall be Model HCGSA4x2 (two) clusters + 1 (one) future. The addition of the future third cluster will result in a unit's capacity of 6.75 MGD.

The chamber shall be constructed of 304 SS. Inlet & outlet shall be 125# ANSI galvanized backup flange and stainless steel ring. Sample points in the form of a 'i' diameter ball valve shall be provided at the inlet and outlet. Lamps shall be protected by polished high purity quartz sleeves. The sleeves shall be of the ozone producing type. The sleeves shall be installed so that the lamps can be removed without breaking the water seal. The channel shall be designed so that if properly installed and operated, there is no possibility of direct operator exposure to UV from the UV lamps. An access hatch shall be provided for each cluster of bulbs.

*Section 2.4A, Second Paragraph:*

*Delete: Sample points in the form of a 'i' diameter ball valve shall be provided at the inlet and outlet.*

*Add: Sample points in the form of a ½" diameter ball valve shall be provided at the inlet and outlet.*

The chamber's inlet and outlet flange size shall be 18" diameter. A 1" NPT drain shall be provided at

the inlet and outlet ends of the channel. Lifting eyes shall be provided for installation and removal of the chambers.

B. UV Lamps

1. Medium pressure high intensity ultraviolet arc tubes shall be provided for disinfection.
2. Maximum power consumption per lamp shall be 5 Kw including the transformer. Lamp operating power levels shall be 3 Kw, 3.3 Kw, and 3.8 Kw for 4 Kw lamps. Lamp output shall not be altered at temperatures as low as 33 deg F.

C. UV Intensity Monitor

1. One lamp in each group of four shall be equipped with a UV monitor which measures the UV intensity of that lamp, providing continuous performance verification over the above specified water transmission range. The monitor shall be fitted with a filter which allows measurement of UV energy between 220 and 290 nm wavelengths only. The wet portion of the monitor shall have a SS housing, viton "O" ring, SS port, and a high purity quartz probe over the monitor site hole. The sensor shall be unaffected by static, electromagnetic fields, or short wave radio emissions. The monitor shall produce a 4-20 ma signal which shall be sent to control module of its group.

D. Automatic Cleaning Mechanism

1. For periodic cleaning of the quartz sleeves and UV monitor probes, each group of lamps shall be fitted with a cleaning mechanism which shall consist of a SS yoke and four Teflon bosses. Each boss shall hold one viton molded wiper ring which fits over the quartz sleeves. Wiper rings shall be replaceable. The automatic cleaning mechanism only shall be operated by means of a two pole bi-directional motor and an acme lead screw. Reed switches shall be provided at the sides of the channel to signal the control system to stop the motor when it reaches either side of the channel. An access hatch shall be provided for manual cleaning of each Cluster of bulbs.

E. Temperature Sensor

1. A temperature sensor shall be fitted to each lamp group for protection against heat buildup under no flow or drained chamber conditions. UV system to shut down and alarm in event of either of the above mentioned conditions.

2.5 UV SPECTROPHOTOMETER

- A. A separate spectrophotometer will be provided by the UV equipment SUPPLIER to be used in the lab to determine the transmission value of the plant's effluent. The UV spectrophotometer will remain the property of the OWNER.
- B. The unit shall be a Hach DR4000 Spectrophotometer with a Deuterium lamp, or accepted equal.

2.6 POWER/CONTROL EQUIPMENT

A. General

1. There shall be a single power/control cabinet for each bulb cluster. Each cabinet shall house one power module provided for each bulb cluster. Space for a third power/control module will be available for the future third cluster of bulbs. The Manufacturer shall provide the capability to add an additional bulb cluster to each UV unit as specified above. Cabinets shall conform to IP 54(NEMA 13). Cabinet ventilation shall be a minimum of 90 cfm with covers installed. Cabinets shall be constructed of stainless steel. The size of each cabinet shall be 82.7"H x 32.5"W x 32.5"D. The door of each cabinet shall be electrically interlocked so that the power/control module are de-energized when the door is opened. Each cabinet shall be equipped with a padlockable power disconnecting device to ensure all power is off to the cabinet and UV unit during maintenance.

*Section 2.6A.1:*

*Delete: Cabinets shall conform to IP 54(NEMA 13). Cabinet ventilation shall be a minimum of 90 cfm with covers installed. Cabinets shall be constructed of stainless steel.*

*Add: Cabinets shall conform to IP 54(NEMA 12). Cabinet ventilation shall be a minimum of 90 cfm with covers installed. Cabinets shall be constructed of epoxy coated steel.*

B. Power Requirements

1. Voltage: 480V, 3-phase Max. Power Demand: 40 Kw (5 Kw per 4 Kw lamp x 2 clusters) @ Power level 3 Nominal Power Demand: 12 Kw (3 Kw per 4 Kw lamp) @ Power level 1 with one cluster running to treat 2.25 MGD.

C. Power Module

1. There shall be one power module for each Cluster of bulbs. The module shall be located, along with the control unit described below, within the power/control cabinet. Each of the power modules shall operate four lamps, using high inductance transformers and capacitors, and non-expendable ballasts.

D. Control Module

1. There shall be one control module for each cluster of bulbs. The module shall be located, along with the power module described above, in the power/control cabinet. Each control module shall contain the following controls and displays.
  - a. Lamp current indicator to verify each lamp is on.
  - b. LED UV intensity readout (%) with a "low UV" indicator.
  - c. Power level control of the respective lamp group.
  - d. Hours run meter.
  - e. Remote on/off cutout for external control of the respective lamp group.
  - f. Circuit breaker protection of incoming circuits.
  - g. Ground fault protection of lamp circuits.
  - h. Cabinet and chamber over-temperature protection.
  - i. Control of automatic cleaning mechanism, if fitted.



## 2.8 MONITORING/INTERFACING AND CONTROL REQUIREMENTS

- A. Each control module shall contain the following output signals for remote monitoring, and input signals for control of that group:
1. Cluster Running -- dry contact which closes when the cluster is energized.
  2. Cluster High Temperature -- dry contact which closes if the lamp group has shut down due to the following: chamber temp >113 deg F, cabinet temp >158 deg F.
  3. Lamp Out--Dry contact which closes for the following: low UV, or lamp burnt out.
  4. Cluster Transmittance 4-20 mA analog signal corresponding to the output of the UV intensity monitor (inline with the UV monitor). This may be connected to a measuring device with a maximum 250 ohm input impedance.
  5. Cluster Ground Fault Detection--A dry contact which opens when the lamp group is shut down due to ground fault.
  6. Wiper Malfunction--a dry contact which closes if the cleaning mechanism malfunctions.

### *Section 2.8A.4:*

*Delete: Cluster Transmittance 4-20 mA analog signal .....*

*Add: Cluster Intensity 4-20 mA signal .....*

- B. Control Scheme - Flow Pacing:
1. The UV system remote control and indication shall be via the Treatment Train Remote I/O Cabinet (TT1RI/O) located inside the Blower Building. The I/O board will be connected to the main PLC that is incorporated in the Plant's SCADA system. Automation of the UV disinfection process will be accomplished using the effluent flow meter, located at the UV Building, to flow pace the UV equipment and control the On/Off operation for each bank of bulbs.
  2. A 4-20 mA signal will be input into the SCADA system from the effluent flow meter. Based upon the instantaneous flow rate the, the SCADA system shall be programmed to either start or stop a lamp group(s), or open or close an motor operated weir gate to allow flow to enter the required UV chamber(s). The UV chambers shall be setup for a lead-lag-type operation. After each 7-day period the lead chamber will switch to help ensure uniform lamp usage between the different UV chambers. When the lag UV chamber is brought online due to high flows, the lag lamp group(s) shall be energized upon the initiation of the opening of the lag weir gate. De-energizing of the last bank of bulbs shall be initiated upon closure of the lag weir gate. Each UV chamber shall be equipped with floating-ball-type level switches as shown on the drawings. These switches are provided and installed by others. The signal from the switches shall be input into the UV control panel, and shall be a permissive for energizing the UV bulbs. The float switches are intended to ensure that the UV bulbs are not energized until after full immersion. 120VAC, 1PH interrogation voltage for the switches shall be from the UV control panels, and closure of the switch contact shall be a necessary permissive for lamp energization.

*Specification Section. 11400, Closed Channel Ultraviolet Disinfection System,  
Paragraph 2.8.B.2.;*

*Modification: Modify the last sentence to delete the requirement for 120 volt single phase interrogation and substitute with "as determined by the supplier of the UV controls."*

3. The following flow pacing scheme shall be programmed into the SCADA control system:

	<i>LEAD (UV Chamber)</i>		<i>LEAD/LAG</i>	<i>LAG UV CHAMBER</i>	
Flow (mgd)	Lamp Group #1	Lamp Group #2	Weir Gate(s)	Lamp Group #1	Lamp Group #2
0-2.24	On	Off	Open/Shut	Off	Off
2.25 -4.4	On	Off	Open/Shut	Off	Off
4.5 -6.74	On	Off	Open/Open	Off	Off
6.75 -9.0	On	Off	Open/Open	On	On

For decreasing flow, the operation of the lamp groups and weir gate(s) shall be in descending order.

*Section 2.8B.3:*

*Delete:*

	<i>LEAD (UV Chamber)</i>		<i>LEAD/LAG</i>	<i>LAG UV CHAMBER</i>	
Flow (mgd)	Lamp Group #1	Lamp Group #2	Weir Gate(s)	Lamp Group #1	Lamp Group #2
0-2.24	On	Off	Open/Shut	Off	Off
2.25 -4.4	On	Off	Open/Shut	Off	Off
4.5 -6.74	On	Off	Open/Open	Off	Off
6.75 -9.0	On	Off	Open/Open	On	On

*For decreasing flow, the operation of the lamp groups and weir gate(s) shall be in descending order.*

*Add:*

	<i>LEAD (UV Chamber)</i>		<i>LEAD/LAG</i>	<i>LAG UV CHAMBER</i>	
Flow (mgd)	Lamp Group #1	Lamp Group #2	Weir Gate(s)	Lamp Group #1	Lamp Group #2
0-2.24	On	Off	Open/Shut	Off	Off
2.25 -4.4	On	On	Open/Shut	Off	Off
4.5 -6.74	On	On	Open/Open	On	Off
6.75 -9.0	On	Off	Open/Open	On	On

*For decreasing flow, the operation of the lamp groups and weir gate(s) shall be in descending order.*

## 2.9 SPARE PARTS

The following spare parts shall be included as a part of the equipment to be supplied:

1. Eight spare lamps
2. Eight sleeves
3. Eight wiper rings
- 4.

### PART 3 - WARRANTIES

The SUPPLIER shall provide a written warranty that provides for:

1. Full replacement of all defective lamps within the first 1000 hours of operation.
2. Full replacement of components against defects in materials and workmanship for a period of one year of operation if equipment is installed within one year of delivery to site.
3. Warranty period shall begin when equipment is installed, or one year after delivery to site.
4. Performance warranty as outlined in Section 1. 1.

### PART 4 - START UP:

When piping, electrical connections, and electrical inspection have been completed and tested, the disinfection system SUPPLIER shall be scheduled for start up. A minimum two week notice shall be given to OWNER prior to scheduled training. During start up, the complete disinfection system shall be given a operating test of normal start and stop, and operating under wastewater discharge conditions. During this test, each unit shall demonstrate its ability to operate properly and shall demonstrate its ability to disinfect . All defects, adjustments, and calibrations shall be made at the expense of the disinfection equipment SUPPLIER. Tests shall be repeated until satisfactory results are obtained. After the system startup has been completed, and before leaving the job site, a training session will be given. The training session will be given to the OWNER's operation personnel to familiarize them with the disinfection system operation, maintenance and adjustments.

## **APPENDIX C**

### **Kill Creek Water Resource Recovery Facility Original Recycled Water Pump Station Specifications**

## SECTION 11550 - RECYCLED WATER PREFABRICATED PUMP STATION

### PART 1 - GENERAL

#### 1.1 DEFINITION

- A. Scope: The recycled water prefabricated pump station will be located inside the ultraviolet/cascade aeration building. The pumping station will pump disinfected water from the sump located immediately upstream of the cascade aeration steps. The plant effluent will be recycled for use onsite to provide process water for treatment equipment, washdown, and site irrigation.
- B. The definitions listed below pertain to this technical specification and do not alter any definitions provided in other technical specifications:
  - 1. The OWNER is City of Gardner, Kansas.
  - 2. The PROJECT is the Kill Creek Wastewater Treatment Plant (KCWWTP).
  - 3. The SITE is Gardner, Kansas.
  - 4. The ENGINEER IS George Butler Associates, Inc.
  - 5. The SUPPLIER is Flowtronex PSI Inc., Dallas, Texas, or accepted equal.
  - 6. The CONTRACTOR is the firm contractually bound to the OWNER for providing and installing equipment and materials for the PROJECT specified in the project documents.

#### 1.2 SUPPLIER SCOPE OF WORK

- A. The SUPPLIER shall provide a complete and operational process pumping system. SUPPLIER to provide single source responsibility for the manufacture, warranty, service and operation of a prefabricated, skid-mounted, fully automatic variable speed pumping system for process, washdown, and site irrigation recycle water. The pumping system shall automatically maintain a constant discharge pressure regardless of varying flow demands within the station rating. Pumping system shall conform to the following specifications in all respects. This specification covers the minimum requirements, however, it should not be construed as inclusive. It is the SUPPLIER's responsibility to include all necessary appurtenances to provide for a complete, automatic, smooth operating, and reliable pumping system. The manufacturer shall supply three complete sets

of general arrangement drawings, electrical power schematics, and control schematics in the pumping system's operations and maintenance manual.

### 1.3 CONTRACTOR SCOPE OF WORK

- A. Furnish all labor, material, equipment, and incidentals required to install the plant's effluent recycle pumping system components, including control, conduits, fittings, piping, mechanical systems, instrumentation, and appurtenances as shown on the Drawings and as specified herein.
- B. The CONTRACTOR shall coordinate the scheduling of all subcontractors for interfacing between crafts and with the SUPPLIER to provide for an complete and operational system.

### 1.4 FUNCTION AND BASIS OF DESIGN:

- A. The unit to be provided is a Flowtronex PSI model FPX-VFCP-475-3-100 (3.0 HP, 25 HP, 25 HP) packaged pumping station rated for 475 GPM at 100 PSI at the pump discharge; 3600 RPM 460/3/60 full voltage. Pumps shall have cast iron casing, bronze impeller, mechanical seal and horizontal NEMA faced totally enclosed motors.

### 1.5 ACCEPTED EQUAL:

- A. The pumping system shall be of the type manufactured by FLOWTRONEX PSI Inc. , Dallas, Texas, or accepted equal, approved by the ENGINEER prior to bid opening. The pumping system shall be of the model number and capacities as specified in this section. For consideration of a proposed equal system, the CONTRACTOR shall furnish the following data to the ENGINEER at least 15 days prior to the date of the bid opening:
  - 1. Complete specification for the pumping system proposed as an equal.
  - 2. Statement of full conformance to the specifications signed by an officer of the manufacturer.
  - 3. General arrangement drawing showing overall dimensions and all piping layouts.
  - 4. Complete submittal data for all major equipment; pumps, motors, filter, variable frequency drive (VFD), programmable controllers (PLC), valves, and motor starters.

5. Electrical schematic showing power wiring.
  6. Installation list of 200 variable frequency drive pumping systems which have been in operation for a minimum of 3 years.
  7. Location of closest VFD factory trained service centers.
  8. Manufacturer's electrical control panel U.L. file number.
  9. Manufacturer's complete pump station U.L. filter number.
- B. If, in the opinion of the ENGINEER, the data submitted shows the pumping system to be an equal to the system specified, the project bidders shall be notified not less than 7 days prior to the bid opening date.

## PART 2 - PRODUCTS

### 2.1 SCOPE:

- A. Pump station shall be a completely skid-mounted horizontal centrifugal VFD pump station built by a single manufacturer. All equipment including but not limited to pumps, motors, valves, instrumentation and controls shall be mounted on a common structural steel base to form a complete operating pumping station.
- B. Standard construction features shall include the following:
1. 3 1/2" silicone filled pressure gauges with isolation valves
  2. Hose bibb connection
  3. Silent wafer check valves
  4. Individual grooved pump discharge isolation valves
  5. Individual grooved pump suction isolation valves
  6. Stainless steel pressure transducer
  7. Heat exchanger
  8. Continuous weld around deck plate
  9. Steel grit blast of all piping and structural members
  10. 4" flow meter spool with Data Industrial flow sensor
  11. 4" station discharge isolation valve
  12. 2" station relief valve
- C. Standard controls shall include the following:

1. U.L. listing of complete pump station
2. U.L. listed NEMA 4 starter and control panel
3. Main disconnect
4. Fused motor protection rated for 200,000 I.A.C.
5. Allen-Bradley microprocessor controller with *SMOOTHFLOW* control software.
6. 25 HP 460 volt variable frequency drive
7. Input line reactor (transient suppression)
8. Dual mechanically interlocked output contactors for automatic alternation of pumps
9. Low discharge pressure shutdown
10. High discharge pressure shutdown with auto restart
11. VFD fault shutdown with auto restart
12. Control power transformers and associated protective equipment for all necessary control power
13. Individual high pump temperature safety shutdown
14. Individual motor phase failure, phase imbalance, and low voltage protection
15. U.L. category B & C surge & lightning arrestor with total power dissipation of 82,500,000 VA. Maximum clamping voltage-1,500 volts (200a Pulse, 8\*20 msec)
16. Lamp test function
17. Individual run time monitoring
18. Automatic alternation of lead pumps
19. First out fault indication
20. Automatic Ramp Up feature (ARU) will slowly ramp up to design pressure (1 psig every 4 seconds) when filling lines and when restarting after a shutdown, or whenever pressure has substantially dropped.
21. Automatic Diagnostic Utility (ADU)
22. Operator Terminal Information System (OTIS) for viewing flows, total flows, setpoints and system pressure, pump station diagnostics, pump run times, and all other registers within the PLC with data logging flow and pressure capability and 253 station event history.

## 2.2 STATION BASE:

- A. The pump station base shall be designed and fabricated to provide proper structural support for all attached equipment. The base shall supply sufficient rigidity to withstand the stresses of reasonable and competent transportation to site, off loading, installation, and operation. Main structural members shall be constructed from heavy weight channel or I-beam steel. Provisions shall be made in the station base for off-loading and handling the station at the site of installation. Base shall include 1/4" checkered deck plate and 1" steel plate



mounted under pump and motor. All 1/4" deck plate and 1" steel plate shall be 100% seal welded to main structural members. Skip welding is not acceptable. Critical frequency of complete pump station shall be above operating frequencies.

2.3 DISCHARGE PIPING:

- A. All piping shall be constructed from ASTM A105 schedule 40 pipe or heavier as required to maintain a 3 to 1 pressure safety factor (including 1/16" corrosion allowance). All piping shall be hydrostatically tested to 150% of maximum shutoff pressure.

2.4 PAINT:

- A. Structural steel, attached piping, and supports shall be grit-blasted with #50 steel grit per SSPC-10 to a near white metal condition. The cleaned steel surfaces shall immediately thereafter be primed with an industrial grade primer to a thickness of 2.5 to 3.0 mils epoxy primer. The finish coat shall be acrylic enamel to a thickness of no less than 3.0 mils. Submit color samples for selection of finish coat color.
- B. The control panel shall be dip cleaned, acid etched and neutralized, iron phosphate coated and painted with a finish coat of 1.5 to 2 mils of polyurethane.

2.5 INORGANIC ZINC PAINT:

- A. The structural steel skid and piping shall be sandblasted to SSPC-SP6. A three-coat inorganic zinc rich paint system shall be applied to a total of 7.0 to 11.0 mills thickness over the steel areas.

Prime Coat	2.0 ■ 3.0 MIL DFT
Carbozinc 11	
No. 33 Thinner	
Intermediate Coat	4.0 ■ 6.0 MIL DFT
Carboline 190 HB	
No. 33 Thinner	
S800 White	
Final Coat	1.0 ■ 2.0 MIL DFT
Carboline 134	
No. 25 Thinner	
To be selected	
Total DFT	7.0 ■ 11.0 MIL DFT

OEM equipment incorporated into the pump station shall be solvent cleaned and coated with 7.0 - 11.0 mills as follows:

Prime Coat	2.0 ■ 3.0 MIL DFT
Rust Bond 8 HB	
No. 25 Thinner	
Red	
Intermediate Coat	4.0 ■ 6.0 MIL DFT
Carboline 190 HB	
No. 33 Thinner	
S800 White	
Final Coat	1.0 ■ 2.0 MIL DFT
Carboline 134	
No. 25 Thinner	
To be selected	1.0 ■ 2.0 MIL DFT
Total DFT	7.0 ■ 11.0 MIL DFT

## 2.6 GALVANIZED PAINT:

- A. Structural Steel & Piping is to be sand blasted to SSPC-SP6 then hot-dipped galvanized to 1480 degrees F temperature with a total dry film thickness of not less than three mils.

## 2.7 BOLTS:

- A. All bolts used in the assembly of the pumping system shall be zinc plated to retard corrosion.

## 2.8 PUMPS:

- A. The main irrigation pump(s) shall be of the horizontal centrifugal type with flow and head defined in the attached technical specifications. The horizontal pumps shall be manufactured according to the standards of the Hydraulic Institute and to ANSI specification No. B58.1. The pump casing shall be ASTM 48, class 30, cast-iron capable of hydrostatic test @ 150% of maximum discharge pressure and have both suction and hub replaceable wear ring. All mating parts shall have a register fit to ensure alignment.

- B. The impeller shall be an enclosed, single piece bronze or cast-iron casting completely machined on all outside surfaces and statically balanced at time of pump assembly. The impeller shall be keyed to the shaft and securely fastened with a vibration resistant lock screw and washer.
- C. The packing box shall contain a mechanical seal for the specific application.
- D. The impeller shall not contact the suction or hub wear ring under any operating load condition.
- E. The pump and motor shall be connected by an ASTM 48, class 30, cast-iron bracket incorporating a full isolating shield with dual slinger rings to prevent moisture from entering the front motor bearing. The main irrigation pump shall be as manufactured by Ingersoll-Dresser Pump Company, or Cornell, or Berkeley.
- F. A pressure maintenance pump shall be provided to maintain system pressure during low demands periods. The pump end shall be of the vertical multi-stage design with the motor mounted directly to the top of the pump.
- G. The pump suction/discharge chamber, motor stool and pump shaft coupling shall be constructed of cast iron. The impellers, pump shaft, diffuser chambers, outer discharge sleeve and impeller seal rings or seal ring retainers shall be constructed of stainless steel. The impellers shall be secured directly to the pump shaft by means of a splined shaft arrangement. Intermediate and lower shaft bearings shall be Tungsten Carbide and Ceramic or Tungsten Carbide and Bronze. Pumps shall be equipped with a high temperature mechanical seal assembly with Tungsten Carbide/Carbon or Tungsten Carbide/Tungsten Carbide seal faces. Pump shall be as manufactured by Grundfos.

## 2.9 MOTORS:

- A. Motor(s) for the irrigation pump shall be of United States manufacture, close-coupled type, totally enclosed, with a 1.15 service factor, and class F insulation. Motors shall be wound for the starting configuration as called out in the technical data sheet. Design pump brake horsepower shall not exceed 98% of motor horsepower exclusive of service factor. Maximum pump run out horsepower shall not be greater than 8% higher than motor rating exclusive of service factor. The motor bearings shall be selected to withstand thrust loads and have a minimum life of 5 years continuous operation. The motor shaft shall be high-strength steel protected by a bronze shaft sleeve secured to the shaft to prevent rotation. Motors shall be as manufactured by U.S. Electric, or Baldor or Reliance.

- B. Motor for pressure maintenance pump shall be sized to ensure the pump is non-overloading when operating on the specified pump curve. The motor shall be of the horsepower, voltage, phase and cycle as called out in the technical data sheet. Motor design shall be totally enclosed, with a NEMA C face design operating at a nominal 3450 RPM with a minimum service factor of 1.15. Lower motor bearings shall be adequately sized to ensure long motor life. Motor for pressure maintenance motor shall be as manufactured by Baldor.

#### 2.10 PUMP CHECK VALVE:

- A. Pump check valves shall be provided on the discharge of each pump and sized per the technical data sheet. They shall be of the silent operating type that begin to close as forward velocity diminishes and be fully closed at zero velocity preventing flow reversal. Valve bodies shall be cast from grade 35 cast-iron or better and shall be free from blow holes, sand holes, and other impurities. The valve design shall incorporate a center guided, spring-loaded poppet, guided at opposite ends and having a short linear stroke that generates a flow area equal to the pipe diameter. Internals shall be machined bronze disc, seat, and stem guide. Seat shall be Buna-N to provide resilient sealing. Dual disc style check valves is not acceptable. Valves shall be sized to permit full pump capacity to discharge through them without exceeding a pressure drop of 2.5 PSI. Check valve shall be as manufactured by Valmatic.

#### 2.11 PUMP ISOLATION VALVES:

- A. Discharge. Pump isolation valves shall be of the butterfly type with grooved ends to provide for expansion and vibration dampening and a lever operator. Lug style isolation valves are not acceptable. They shall be sized as shown in the technical data sheet. Valve body shall be constructed of ductile iron with a polyphenylene sulfide coating. Valve disc is rubber coated ductile iron. Valve shall be rated to 300 PSI. Isolation valve shall be as manufactured by Victaulic Company of America.

#### 2.12 PUMP ISOLATION VALVES:

- A. Suction. Pump isolation valves shall be installed on the inlet of the pump to completely isolate the individual pumps. Valve shall be of the lug style butterfly type. Valve shall have one piece body cast from ASTM A126 cast iron. Stem shall be 416 stainless steel. Disc shall be nickel plated ductile iron. Stem bushings shall be Acetyl to prevent stem seizure to body during prolonged periods of non-use. Seat shall be Buna-N elastomer, one piece construction, and shall

also form the flange sealing gaskets. Valves 8" and smaller shall have a lever operator. Valves 10" and larger shall have a gear operator with hand wheel. Valve shall be rated at 200 PSI bubble shutoff. Pump suction isolation valve shall be as manufactured by Watts.

#### 2.13 PRESSURE RELIEF VALVE:

- A. A pilot operated modulating pressure relief valve shall be included and sized per the technical data sheet. The valve shall be set 7 to 10 PSI above operating pressure and will relieve when inlet pressure exceeds spring setting on pilot. Valve shall be quick opening and slow closing to minimize surging. Valve body shall be cast iron with 125 lb. inlet and outlet flanges, and shall be rated for 200 PSI. A wye strainer shall be installed in the inlet side of the valve body to provide clean water to the CRL pilot. A wafer style butterfly valve shall be installed on the inlet and outlet of the relief valve. Specifications for this isolation valve will be the same as for the station isolation valve found later in the specification. Relief valve shall be as manufactured by CLA-VAL.

#### 2.14 PRESSURE GAUGE:

- A. A pressure gauge shall be mounted on the suction and discharge header with an isolation ball valve. All gauges shall be silicon filled to reduce wear due to vibration. Accuracy shall be within 2%. Gauge diameter shall be 3 ." minimum. Range shall be at least 30% higher than the highest pressure attainable from the pumps at shutoff head conditions. Stainless steel back & bronze internal. Pressure gauge shall be as manufactured by Ashcroft.

#### 2.15 STATION ISOLATION VALVE:

- A. Station isolation valve shall be installed on the discharge of the pump station to completely isolate the pumping system from the irrigation system. Valve shall be of the lug style butterfly type. Valve shall have one piece body cast from ASTM A126 cast iron. Stem shall be 416 stainless steel. Disc shall be nickel plated ductile iron. Stem bushings shall be Acetyl to prevent stem seizure to body during prolonged periods of non-use. Seat shall be Buna-N elastomer, one piece construction, and shall also form the flange sealing gaskets. Valves 8" and smaller shall have a lever operator. Valves 10" and larger shall have a gear operator with hand wheel. Valve shall be rated at 200 PSI bubble shutoff. Station isolation valve shall be as manufactured by Watts.

### PART 3 - ELECTRICAL

### 3.10 SCOPE:

- A. To provide complete instrumentation and controls to automatically start, stop and modulate pump speed(s) to smoothly, efficiently and reliably pump variable flow rates at a constant discharge pressure. Full alarms and safety features needed to protect the equipment and irrigation piping system.

### 3.20 CONTROL ENCLOSURE:

- A. Controls shall be housed in a NEMA 4 enclosure with integral latches. The control enclosure should be constructed of 12 gauge steel and the back plate assembly shall be constructed of 12 gauge steel. The enclosure shall be painted as specified in the paint specification listed under Section 2.0 Mechanical. All indicating lights, reset buttons, speed potentiometer, selector switches and the operator interface device shall be mounted on enclosure door and also be rated NEMA 4. All internal components shall be mounted and secured to the removable back plate assembly. A closed type cooling system shall be included to cool the enclosure and reject heat from the VFD. Open type cooling systems allowing outside ambient air to enter the panel are not acceptable. No water line connections shall be permitted inside of the control enclosure.
- B. The VFD LCD display shall be viewable through a water-tight plexiglass window built into the control panel door.

### 3.30 LIGHTNING AND SURGE ARRESTER:

- A. All electrical equipment shall be protected by a U.L. approved Category C and Category B surge arrester to suppress voltage surges on incoming power. The device under IEEE C62.41 Category C will withstand a impulse of 10Kv/10Ka and Category B to withstand a ringwave of 6Kv/500a and a impulse of 6Kv/3Ka. Pass voltage for a 480v device to the end equipment shall not exceed 1500V-1800V when subjected to a 8ms \* 20ms waveshape resulting in the following performance statistics: 3720 joules minimum with a power dissipation of 82,500,000VA at 1800V maximum pass voltage to the protected equipment. Response time shall be less than 5 nanoseconds.

### 3.40 MAIN DISCONNECT:

- A. A non-fusible main disconnect shall be provided to completely isolate all controls and motor starting equipment from incoming power. Main disconnect shall have a through the door operator, and shall be sized as shown in the technical data sheet. Disconnect shall be as manufactured by ABB.

### 3.50 CONTROL POWER:

- A. Power for the controls shall be provided by a control power transformer which will provide 120 volt, single phase power for the pumping system control operation. Control power transformer shall not be used for any other external load. The control power transformer shall be protected on the primary side by control limiting fuses of adequate size and voltage rating. All control components will be protected by time delay circuit breakers of adequate size. Control power transformer shall be as manufactured by Acme.

### 3.60 MOTOR STARTING EQUIPMENT:

- A. All motor starters for the pumping station shall be mounted on a single back panel in a single NEMA 4 enclosure as specified in section 3.10. Motor starters shall meet I.E.C. standards and shall be rated for a minimum of 1,250,000 operations. Each main irrigation motor shall have dual contactors which are both electrically and mechanically interlocked to allow the VFD to operate on any of the motors as called out in the technical data sheet. Motor overload relays shall be I.E.C. rated class 10 ambient compensated. Fuses shall supply short circuit protection to each motor and shall be rated for a minimum 200,000 amp interrupting capacity. Motor starters shall be as manufactured by Allen Bradley.

### 3.70 VARIABLE FREQUENCY DRIVE:

- A. The variable speed drive shall be a digital, pulse width modulation (PWM) variable frequency drive (VFD) with IGBT transistors. The VFD shall have a minimum wire to wire efficiency of 98.5%, and shall be rated up to 550 volt operation in order to eliminate nuisance tripping at marginally high voltage conditions. Front end shall be protected by fast acting semiconductor fuses. Any VFD error messages shall be displayed on a 40 character LCD readout in English or any one of 8 other languages. The following fault protection circuits shall be included: Overcurrent (200%), Overvoltage (130%), Undervoltage (60%), Overtemperature (70 Deg. C), Ground fault, and Motor overload. The VFD shall be capable of starting into a rotating load and accelerate or decelerate to setpoint without safety tripping. The VFD shall have an automatic extended power loss ride through circuit which will utilize the inertia of the pump to keep the drive powered. Minimum power loss ride-through shall be one cycle based on full load and no inertia. The VFD shall be optimized for a 3 kHz carrier frequency to reduce motor noise. The VFD shall employ three current limit circuits to provide "tripless" operation. The following operating information

shall be displayed on the VFD LCD: KWH, elapsed time, output frequency (Hz), motor speed (RPM), motor current (amps), and voltage. Line reactor will be installed on input of VFD to protect against voltage transients. The VFD LCD display shall continuously scroll through all operating information and shutdown faults while the drive is running and while stopped. This information shall be viewable through a water tight plexiglass window on the control panel door as specified in Section 4.0. The VFD shall be as manufactured by ABB.

### 3.80 PRESSURE TRANSDUCER:

- A. Pressure transducer shall be utilized for providing all pressure signals for the control logic. Pressure transducer shall be a solid-state bonded strain gage type with an accuracy of plus/minus 0.20% and constructed of 316L stainless steel. Transducer shall be rated for station discharge pressure as shown on technical data sheet, and shall provide gauge pressure output, rather than an absolute. Pressure transducer constructed of plastic is not acceptable. Pressure transducer shall be as manufactured by Druck.

### 3.90 FLOW METER:

- A. The pump station shall have a flow sensor installed which will provide the pump station flow rate and total flow through the operator interface device (OID) as specified in Section 4.0. The flow sensor shall be a six bladed design which provides a low impedance signal proportional to the flow. The accuracy shall be plus/minus 2% of actual flow rate between flow velocities of 1-30 ft./sec. A flow meter run shall be included with a minimum of 5 pipe diameters straight run upstream and 2 pipe diameters downstream for proper meter accuracy. Meter run shall be sized as shown in technical data sheet. Flow sensor shall be as manufactured by Data Industrial.

## PART 4 - PUMP CONTROL

### 4.1 CONTROLS:

- A. All control logic shall be handled by an industrial grade programmable logic controller (PLC) with a 40 character LED industrial operator interface providing data entry and read-out capabilities. PLC shall have LED indicators for input, output, and six diagnostic read-outs showing PC Run, CPU Fault, and two communications, (battery and force). An LED visual status light is provided for each I/O to indicate on/off status. PLC shall be provided with a built in EEPROM, capacitor, and battery for memory backup. All logic for system control, timing, and control of VFD speed shall be handled by the PLC. A



separate set point controller is not acceptable. PLC shall have a built in clock calendar. The PLC shall be as manufactured by Allen Bradley.

- B. Control software shall be parameter driven, fully documented, and allow user to easily change ALL operational parameters. Standard control features and equipment which need to be included as a minimum are as follows:

1. Alarms and shutdowns:

Low discharge pressure  
High discharge pressure (Attempt restart)\*  
Low suction pressure or Loss of Prime (Attempt restart)\*  
Phase loss (Attempts restart)\*  
Low voltage (Attempts restart)\*  
Phase unbalance (Attempts restart)\*  
Phase reversal  
Individual motor overload/phase loss (indicates which individual motor was shut down)  
VFD fault (shutdown VFD pump only and attempts restart)\*

\* Three unsuccessful restarts in 15 minute period will give hard shutdown.

All alarms will be indicated by a red general alarm light. Specific alarm conditions along with procedures for correction will be displayed in English on the operator interface display (OID).

Individual motor phase failure and low voltage safety circuitry shall retire any pump that experiences low voltage, phase failure or phase unbalance as monitored at the load-side of each pump motor contactor. Each pump motor shall have its individual protective device and time delay to allow for transient low voltage during motor starting to allow maximum motor protection. Separate main phase failure and low voltage safety circuit shall also be provided to retire the pumping system if it experiences low voltage, phase failure or phase reversal as monitored at line-side of control enclosure. Phase monitor shall have a time delay to allow for transient low voltage during motor starting and to allow maximum motor protection. Operator interface device (OID), mounted in enclosure door, shall signal phase failure for any affected pump. The individual pumps or pumping system shall not operate until the voltage problem has been corrected and safety has been manually reset. Single incoming phase monitor safety circuit is not acceptable.

B. Panel face switches and lights:

1. Individual pump run lights

2. Individual pump on/off switches
  3. System Hand/Off/Automatic switch
  4. Mode Select switch -- allows automatic bypass mode of operation which can be used if VFD should fail
  5. VFD selector switch -- in manual mode, allows user to select which pump will be run of the VFD
  6. Reset -- Acknowledges pump station alarms
  7. Speed potentiometer -- in manual mode allows user to adjust VFD pump speed
  8. Low discharge pressure override switch -- disables low discharge pressure alarm
- C. PLC bypass switch mounted inside panel allows user to manually operate pumps should PLC fail.
- D. Four distinct set point pressures (normal, lockouts 1 & 2, and high elevation). The lockout feature gives the user the flexibility to lower the set point pressure automatically at days and times, and "locking out" the operation of one or more of main pumps if local power authority imposes penalties for operating these pumps during such times. It also allows user to set a maximum RPM for the VFD pump during these lockout times so that user can limit amperage draw during penalty periods. The high elevation set point can be tied into a computerized irrigation system, or directly linked to high elevation satellites. When high elevation satellites are operating, control software will automatically and gradually elevate the pressure to the new desired set point. When finished, the high set point will be lowered back to normal. The high elevation set point will only be used if called out on the technical data sheet.
- E. Software will be included to automatically and gradually ramp up irrigation system pressure to the desired operating pressure (i.e., 1 PSI every 4 seconds) without overshooting design pressure. This feature operates whenever pressure drops below set point pressure. This ramp up time is fully adjustable by the operator. This control feature is based on an increase in pressure over a pre-defined time period. The acceleration control on the VFD is NOT an acceptable means of adjusting pressure ramp up speed.
- F. Software will be included for optionally maintaining a lower irrigation system pressure when not irrigating. Reduced pressure values will be shown in the technical data sheet. Controls will cycle the PM pump at these reduced pressures during non irrigation times and pressure will gradually increase to design pressure when the irrigation periods begin

- G. Neither flow meter nor VFD output frequency shall be used for shutting down last VFD driven pump. Controls and software shall incorporate a method to eliminate excessive cycling of VFD pump at very low flow conditions, yet not run the pump excessively at no flow conditions.
- H. Automatic alternation of VFD driven pumps. This shall be accomplished by incorporating dual mechanically and electrically interlocked contactors allowing alternation of the VFD between pumps.
- I. Real time clock calendar allows PLC to internally provide all date and time functions used above.
- J. Two separately adjustable PID control loops for both low flow and high flow pressure stability.
- K. User shall be able to field select either of two modes of VFD operation. Auto switch VFD option allows VFD to sequentially start each pump. The standard mode of operation starts the first main pump on the VFD and the remaining pumps start across the line as required.
- L. Shutoff algorithm for fixed speed pumps to minimize pump cycling while also remaining responsive to sudden flow reductions. Minimum run timers alone for minimizing fixed speed pump cycling is not acceptable. Discharging through relief valve during pump transitions is not acceptable.
- M. Full manual operation capability with panel face-mounted speed potentiometer for manually adjusting VFD speed.
- N. System can be immediately and directly switched from manual to automatic mode of operation. This allows for manual pressurization and immediate switching capability to automatic.
- O. Light test sequence: Pressing the reset button for 5 seconds illuminates all lights.
- P. Rate of pressure change algorithm to rapidly determine if there is an irrigation demand and immediately cycle on the VFD pump, instead of waiting for pressure to drop to a predetermined start pressure.
- Q. All pump station shutdowns shall be of the controlled type that sequentially phase pumps off at user selectable intervals to reduce water hammer within the irrigation system.
- R. The pump station software program shall be user friendly enough to enable the setpoint pressure from being raised or lowered by the end user at the

pump station or through the remote monitoring software package if provided. The pump station software latter logic shall be written in such a way that no other value would require changing if the setpoint pressure had to be adjusted. Pressure maintenance pump and main irrigation pump start pressures, the pressure maintenance pump stop pressure, low discharge shutdown and high discharge shutdown shall not be a specific value but a differential pressure off of setpoint (i.e., pressure maintenance pump (PMP) to start 5 psi below setpoint and stop 5 psi above setpoint).

#### 4.2 OPERATOR INTERFACE DEVICE (OID):

- A. The pump station shall include a NEMA 4, 40 character LED display and keypad mounted on the control panel door. This device will allow the operator to view and selectively modify all registers in the PLC. The unit shall store its messages in non-volatile memory. The operator interface device shall incorporate password protection for protecting data integrity. The device will allow for display and modification of all timers, set points, lockout times, etc. The device shall communicate with the PLC through the programming port, and shall include an RS232 communications port allowing a printer to be attached for real time station status logging.
- B. In addition to normal data entry keys, the device shall include a minimum of the following function keys labeled:
  - A. Events. Displays the last 254 sequential pump station events with date and time of occurrence. Events shall include but not be limited to: all alarms, starting of individual pumps, stopping of individual pumps and changing of selector switches.
  - B. Pumplog #1. Operator can scroll through the historical pump station flows and pressures for up to the last 7 days. Sampling time periods can be changed by the operator (from 10 seconds to 60 minutes). Averages are taken over the sample period and the average recorded with date and time stamp.
  - C. Pumplog #2. Station flow and pressure are shown every second for the previous 60 seconds and every minute for the previous 30 minutes. If a shutdown occurs, the flow and pressure tables are locked in so that the operator may view how the pump station was performing immediately before the shutdown occurred.
  - D. Status. Will display the current operating status. When the station is running, the display will show the setpoint pressure, actual pressure, flow, and pump RPM.

- E. Alarm Information. Last nine alarms recorded in memory and are displayed with related detailed information on the alarm, time of occurrence, date, pumps operating at time of alarm and how to correct the alarm condition.
- F. Daily Log/Total. It will display the following: Last time of log reset, individual pump run times, run times since last reset, pump starts, pump starts since last reset, total flow, and total flow since last reset.
- G. Scroll Key. Used to scroll up and down through data. The OID shall be an information system only and not required for pump station operation. No switches, reset buttons, general alarm light, run lights or speed potentiometers are included within this unit. The pump station will be fully functional in the event the OID unit should fail.

#### 4.3 CODES:

The control panel with controls shall be built in accordance N.E.C., and U.L. standards. The pump station including electrical components and enclosure shall be labeled as a complete U.L. listed assembly with manufacturer's U.L. label applied to the pump station. All equipment and wiring shall be mounted within the enclosure and labeled for proper identification. All adjustments and maintenance shall be able to be done from the front of the control enclosure. A complete wiring circuit and legend with all terminals, components, and wiring identification shall be provided. Main disconnect shall be interlocked with door.

#### 4.4 OPERATION:

During nonirrigation times, the pressure maintenance pump (PM) will cycle on and off as required to maintain irrigation system pressure. The start and stop pressure shall be a differential off of setpoint. The cycling pressures can be user selected and can be set substantially below normal set point pressure, if desired. If the PM pump cannot maintain the desired pressure, then the VFD will start the first pump and will gradually ramp the pressure up to desired irrigation pressure. The start pressure of the VFD pump shall be a differential below the setpoint. The pump speed will be modulated to hold a constant discharge pressure regardless of flow. As the flow rate increases and the VFD pump can no longer maintain pressure while at maximum speed, the next sequential pump will be started and the VFD driven pump will accordingly reduce its speed and modulate. An algorithm shall be included for accurately reducing the VFD pump speed as the next sequential pump is started so that no pressure surges are generated during the transition (even with across the line starting). If the user prefers to switch the VFD from pump to pump for sequential starting, he can select this option with the OID. As the

flow continues to increase, pumps will sequentially be started until all pumps are running. As the flow begins to decrease, pumps will be sequentially turned off until only a single VFD driven pump is operating. When a no flow condition occurs, the VFD pump shall be turned off.

## Part 5 - INSTALLATION

### 5.0 GENERAL:

Others shall be responsible for providing all materials, equipment, and labor necessary to install all items associated with the pump station.

### 5.10 UNLOADING AND SETTING SUPERVISION:

Setting and connection of the pump station is the responsibility of the CONTRACTOR.

### 5.20 START UP:

When discharge piping, electrical connections, and electrical inspection have been completed, the pump station SUPPLIER shall be contacted for start up. A minimum two week notice shall be given to OWNER prior to scheduled start up date and training. During start up, the complete pumping system shall be given a running test of normal start and stop, and fully loaded operating conditions. During this test, each pump shall demonstrate its ability to operate without undue vibration, or overheating and shall demonstrate its general fitness for service. All defects, adjustments, and calibrations shall be made at the expense of the pump station SUPPLIER. Tests shall be repeated until satisfactory results are obtained. After the station startup has been completed, but before leaving the job site, a training session will be given. The training session will be given to the OWNER's operation personnel to familiarize them with the pumping system operation, maintenance and adjustments.

### 5.30 WARRANTY:

The SUPPLIER shall warrant that the water pumping system components will be free of defects in workmanship for one year from date of OWNER authorized start-up. SUPPLIER will provide replacement parts or components during the warranty life. Repairs shall be done at SUPPLIER's expense, but must be pre-authorized by SUPPLIER. The start-up certificate will be filed by the CONTRACTOR with the SUPPLIER to activate warranty. Upon request, SUPPLIER will provide advice for trouble shooting of a defect during the warranty period.





**KILL CREEK WRRF RFP Proposal  
UV**

**Project WW2001  
Gardner, KS**

**Glasco UV NONCON Option**

**MANUFACTURER'S REP.:**

**HAYNES EQUIPMENT COMPANY, INC  
15725 PFLUMM ROAD  
OLATHE, KS 66062**

**March 2, 2021**





15725 Pflumm Road  
Olathe, Kansas 66062  
Phone: 913-782-4962  
Cell: 913-481-7358  
Web: [www.haynesequip.com](http://www.haynesequip.com)  
Email: [ssorenson@haynesequip.com](mailto:ssorenson@haynesequip.com)

March 2, 2021

ATTENTION: City of Gardner, KS

REFERENCE: KILL CREEK WRRF  
UV Disinfection and Recycled Water Systems  
Project WW2001

RFP DUE DATE: March 2, 2021 at 12:00 pm

Dear Ladies and Gentlemen:

Haynes Equipment Company, Inc. is pleased to offer the following equipment on the above referenced project. For your consideration our quotation is as follows:

EQUIPMENT	DESCRIPTION	MFR.
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UV	<b>OPTION 1: Chambered System for 9 MGD</b>	GLASCO UV
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- Two (2) IL-BT-9500-16-AW reactors with 304 SS elbows.
  - Automatic cleaning center with compressor, regulator and dryer.
- One (1) shared System Control Center/Ballast control center with Allen Bradley PLC for alarming, dimming and other functions.
  - System's operator user interface is a 11" Rohtek Color touch.
  - Control Center to be installed on ground level of UV building.
  - UV intensity monitoring, lamps status LEDs, and running time meter. One (1) transformer.
- Design layout approved by plant personnel; effluent pipe to be cut back to 1' from wall BY OTHERS.
- Freight and Startup Services included.
- See Chambered Proposal Package for all of the details.

**TOTAL Glasco Chambered Option: \$ 210,000**

UV	<b>OPTION 2: NONCON System for 9 MGD</b>	GLASCO UV
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- Two (2) NONCON reactors with internal heat management system. Cooling pumps will be supplied. One cooling system per bank.

- One (1) Bank - each bank having eight (8) UV modules – each holding eleven (11) lamps. Eighty-eight (88) lamps. Sixty (60) tubes will extend through reactor.
- One (1) Ballast Control Center (BCC) NEMA 4X modified Type 304 SS free standing enclosure. Includes LEDs, Run Time and UV monitoring system.
- One (1) System Control Center Allen Bradley PLC for alarming, bank pacing and other functions. System's operator user interface is a 11" Rohtek Color touch. One (1) transformer.
- Layout/Design approved by plant personnel. North staircase (facing east) needs to be moved 90 degrees to face north. BY OTHERS.
- Freight and Startup Services/Training Included.
- See NONCON Proposal Package for all of the details.

**TOTAL Glasco NONCON Option: \$ 259,750**

**RECYCLED  
WATER PUMP  
STATION**

**PRIMARY OPTION: CRE Pumps with MLE Motors/Integrated VFDs**

**GRUNDFOS**

- (1) HydroMPC-E system for 475 GPM @ 100 psi to replace the existing recycled water system
  - (2) CRE-45-3-1 pumps which include integrated VFD on each 25 hp motor, 460/60/3
    - See attached datasheet and page 3/10 in the HydroMPC-E specification for more information on integrated VFDs.
  - Control Panel includes the CU352 Pump Controller specifically designed to control parallel operation of multiple pumps
  - See detailed RFP requirements, installs, datasheets, proposal, specification and IOM manuals attached

**TOTAL Grundfos Primary Option (no adders) HydroMPC-E 2CRE-45: \$ 45,779**

**RECYCLED  
WATER PUMP  
STATION**

**ALTERNATE OPTION: CRE Pumps with Panel Mounted VFDs**

**GRUNDFOS**

- (1) HydroMPC-EC system for 475 GPM @ 100 psi to replace the existing recycled water system
  - (2) CR-45-3-1 pumps with standard 25 hp motors, 460/60/3
  - Panel mounted VFD which is the Grundfos CUE
    - See datasheet and page 3/11 in the HydroMPC-E CR specification for more information on the CUE, panel mounted VFD.
  - Control Panel also includes the CU352 Pump Controller specifically designed to control parallel operation of multiple pumps
  - See detailed RFP requirements, installs, datasheets, proposal, specification and IOM manuals attached

**TOTAL Grundfos Alternate Option (no adders) HydroMPC-EC 2CR-45: \$ 57,830**

**Recycled Water Pump Station Notes:**

- **WARRANTY:** 24 months from start-up of equipment, or 30 months from shipment, whichever is sooner.
- Freight included.
- Haynes Equipment startup and training included.
- Piping will be needed to connect discharge to current discharge – BY OTHERS.
- Existing base can be reused if desired.
- The manifold ISOs and mechanical couplings are by others.
- There are options for dry run protection in the panel settings using different sensors or switches, but that feature can only accept one Digital or Analog Input to turn the system on/off when inlet pressure or water level is low.
- The panels use fuses, not circuit breakers. This is a UL requirement for panels with the given VFD and at the given SCCR.
- The panel options include surge arrestors, but lightning arrestors are not available.
- Panels are Fan-cooled. There is No Heat Exchange or A/C included.
- No PRV or tap for one included.
- The MLE is nameplated for 480V +/-10% (UL listing), which falls short of 550V on the original spec.
- The MLE system options does not and cannot include VFD Bypass switches. line reactors, or additional custom options on the alternative CUE system selection.
- Some features on the panel based on the old spec are accessed through the controller settings (e.g. HOA, elapsed time, etc).
- Phase/voltage monitor is on main power supply, not each pump.

Thank you for your consideration of Grundfos recycled water skid as well as the Glasco UV system.

Sincerely,



Shawna Sorenson, Haynes Equipment Co.

## Glasco UV / Haynes Package Proposal for UV NONCON Option



### PROPOSAL REQUIREMENTS

#### KILL CREEK WATER RESOURCE RECOVERY FACILITY UV Disinfection and Recycled Water Systems Project WW2001

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Vendor's Proposals shall include all the separate sections identified in the following Sections Requirements. Partial or incomplete submittals or submittals with responses in an order that does not match that presented in the Section Descriptions below may result in disqualification.

#### Section 1. Experience and Qualifications

Describe the experience and qualification of the Vendor to include:

1. Number of years the Vendor has been in business.  
(22 years)
2. Number of years the Vendor has been in the business of disinfection of municipal wastewater with UV disinfection.  
(22 years)
3. Listing of manufacturing facilities for equipment proposed for this project, the location of these manufacturing facilities, and years in operation.  
(Glasco UV, Mahwah, NJ 07430 (18 Years))
4. Sales for the model of equipment proposed for the past five fiscal years.  
(\$2,900,000 over the past 5 years)

#### Section 2. Description of Equipment Proposed

Describe, through use of technical drawings and technical literature, how the proposed equipment meets or exceeds the currently installed system requirements. The Vendor shall include a description of all auxiliary or support equipment and any warranties and services provided by Vendor.

The Vendor shall provide in summary of proposed equipment a general arrangement drawing for the City showing proposed layout for equipment systems, modules, AND ancillary equipment including ballast enclosures, power and light panels, HMI's, and any other control or electrical equipment recommended.

The following items shall be included but not limited in the equipment description summary and general arrangement drawings:

1. Model number of UV equipment: NONCON-11-8X60
2. System peak capacity in MGD 9 MGD
3. Number of UV lamps 88
4. Power consumption calculations for the proposed equipment see page 5 of PDF
5. Panel and enclosure dimension See Page 23 of PDF
6. Electrical room dimensions and enclosure spacing See page 23 PDF
7. Calculations demonstrating the proposed equipment provides the UV doses as required for disinfection. See page 25 of PDF
8. Calculations showing head loss through UV modules under design peak flow conditions. See page 26 of PDF

Please see the following documents:

(Scope of Supply: Page 5 of PDF)

(Specification: Page 14 of PDF)

(Drawing Package: Page 22 of PDF)

(UV DYS Calculations: Page 26 of PDF)

(Headloss Calculations: Page 27 of PDF))

### Section 3. Experience with Installed Equipment

Provide the following data on at least five similar installations by Vendor of the equipment type or model proposed with the following minimum information. At least five installations shall be located in the United States and shall have at minimum, the same number of lamps as proposed for the City and shall have been in service over two years. Additional installations may be submitted, and the equipment installed at the other referenced installations should be of similar size and in a similar application to that proposed for the Kill Creek Wastewater Resource Recovery Facility.

1. Plant Name/Location/Owner
2. Owner's current contact person and phone number
3. Date Installed or commissioned
4. Upstream treatment processes (i.e., primary, activated sludge, filtered, etc..)
5. Approximate hours run on equipment since installation
6. Disinfection performance obtained
7. Corrective maintenance history (warranty repairs, parts replaced under warranty, parts purchased from manufacturer after warranty)

(Please see the Glasco UV Chamber Reference Document Page 28 of PDF)

#### Section 4. Preventive Maintenance Requirements

Provide a tabulation of preventive maintenance requirements that includes for each task:

1. Task description,
2. Frequency of task,
3. Estimated staff hours to perform the task,
4. Equipment, materials, and tools required to perform the task.

Tabulation should be from Manufacturer's standard literature.

(Please see the Preventative Maintenance Document Page: 30 of PDF)

#### Section 5. Service and Parts Facilities, and Service Staff

1. Provide if the service technicians full-time employees of the Vendor or contract services.

Haynes Equipment Company Full Time Employees

2. Provide the normal response time for on-site services from the time of order to the arrival of a service technician.

(True Emergency: Same Day Response)

(Urgent Maintenance Issue: 1-2 Days)

(Regular Maintenance: Schedule 2 Weeks in Advance)

3. List the locations of the Manufacturer's service facilities in the United States.

(Haynes Equipment Company 15725 Pflumm Road, Olathe, KS 66062)

4. List the parts-stocking warehouse locations in the United States.

(Glasco UV Manufacturing Shop and Warehouse: Mahwah, NJ 07430)

- - i. Are all parts for the proposed equipment type or model available at these locations?

(All parts are available to order from Glasco UV Manufacturing Shop and Warehouse)

5. Provide the normal lead time for delivery of parts from time of order,

(Most parts will ship within 1-2 weeks from time of order)

6. Provide a detailed list of spare parts included in the Vendor's proposal.

- i. Include current list price for each spare part sold by Vendor.

(Please see the Parts, Pricing, and Information Document Page: 31 of PDF)

#### Section 6. Schedule of Prices

1. Attach completely, Schedule of Prices for proposed equipment, included spare parts, and services provided in Vendor's proposal.
2. Provide a formal "Quotation" complete with a detailed scope of services and all terms and conditions suitable for giving to a bidding contractor for the installation construction contract. This shall include initial equipment costs, guaranteed power consumption at design average conditions, and guaranteed costs for replacement lamps, ballasts, and intensity sensors. Vendor shall guarantee purchase price for lamps, ballasts, and intensity sensors for **five (5)** years following the date of Substantial Completion of the equipment installation construction contract.
3. The Vendor is hereby notified that the "Schedule of Prices" will be made available to all bidding installation contractors who request them if the Vendor selected.

Please see the following documents:

(Scope of Supply: Page 5 of PDF)

(Parts, Pricing, and Information: Page 31 of PDF)

#### Section 7. Start-up and Training

1. Provide start-up and training plans including minimum number and duration of startup, testing, and training sessions and number of technicians per visit. Training plan should include description of training including methods of instruction and sample handouts, presentations or reference material.

Glasco UV Shall provide the minimum:

One (1) day for installation support)

One (1) day for testing.)

One( 1) day for classroom training)

(Please see the Sample Training Slides: Page 32 of PDF)

GLASCO UV

# UV DISINFECTION PROJECT PROPOSAL

## NONCON S E R I E S

<b>Project Name:</b>	<b>Gardner, KS</b>
Proposal Number:	GUV012-100737
Date:	February 17, 2021

<b>Prepared by:</b>	<b>Romeo Vela</b> Director of Engineered Products
Email	<a href="mailto:romeo@glascouv.com">romeo@glascouv.com</a>
Mobile	973-634-0903

<b>Prepared for:</b>	<b>Shawna Sorenson</b>
Company	Haynes Equipment
Email	<a href="mailto:ssorenson@haynesequip.com">ssorenson@haynesequip.com</a>
Phone	<a href="tel:913-481-7358">913-481-7358</a>
Website	<a href="http://haynesequip.com">haynesequip.com</a>

<b>Project Type:</b>	<b>Wastewater</b>
Type	Fluoropolymer Tube
Orientation	Horizontal – Stainless Steel reactors
System Name	NONCON-5000-11-8 x 60
Lamp Technology	Low pressure high output 155 W
Flow rate range	4.5MGD + 4.5 MGD



### EQUIPMENT

#### Standard

- Stainless steel reactors with inlet and outlet boxes. Cooling pumps
- Remote Ballast Control Centers
- Wireway from BCC
- UV monitoring
- 1 x PLC monitoring (AB Micrologix)

#### By Others

- Inlet isolation gate
- Integration





## Design Information

### DESIGN OVERVIEW

Application	Wastewater
Peak flow	4.5 US MGD
Average	1.0 US MGD
Minimum flow	0.00
Location	Indoors

Water Quality	
UV transmission %	62%
Influent counts	200,000 fc/100 ml
Water temp.	46-75° F
TSS	<30 mg/l
BOD	<30 mg/l
Discharge permit	<200 fc/100 ml
Design UV dosage	>25,000 uWs/cm <sup>2</sup> @ end of lamp life

Dimensions	
Channel length	138"
Channel width	67"
Channel height	30"
Connections	18" pattern
Ballast Control Center	NEMA 4x stainless steel free standing located above units

### EQUIPMENT OVERVIEW

Model Name	NONCON-5000-11-8 x 60
System type	Horizontal
Configuration	Reactor
Lamp type	Low pressure high output 155 watts
Reactors	2
Banks per reactor	1
Modules per bank	11
Lamps per module	8
Lamps per bank	88
Tubes per system	60
UV monitoring	0-100% - 4-20 ma
Lamp status	Green LEDs
Remote control	H/O/A
Voltage	480 V 3 phz
kW/hr	15.5 kW per bank

Integration	
UV output	4-20 mA from UV
Flow signal	Required
Basic PLC	AB Micrologix 1400
Remote control	H/O/A

## Scope of Engineering

The following documentation will be provided by Glasco UV at the time of submittal:

Installation Operation and Maintenance manual, layout drawings, P+ID drawings, ladder logic diagrams, terminal block diagrams, Warranty requirements, long term storage requirements, bills of materials, equipment descriptions, equipment brochures, head loss calculations, UV DIS calculations, equipment installation lists and other relevant documentation.

## Scope of Supply

Qty	Description
Two (2)	NONCON reactors with internal heat management system. Cooling pumps will be supplied. One cooling system per bank.  Bank - each bank having eight (8) UV modules – each holding eleven (11) lamps. Eighty eight (88) lamps. Sixty (60) tubes will extend through reactor.
One (1)	Ballast Control Center (BCC) NEMA 4X modified Type 304 SS free standing enclosure. Includes LEDs, Run Time and UV monitoring system.
One (1)	System Control Center Allen Bradley PLC for alarming, bank pacing and other functions. System's operator user interface is a 11" Rohtek Color touch. One (1) transformer

### Spares

UV Lamps	8
Ballasts	2
Operator safety kit	2
Cleaning kit	1
Operation Manuals	3
Field UVT Monitor	1
FEP TUBE	4

## Commercial Offering

<b>TERMS:</b>	Net 30 days	10% upon approved drawings 80% upon equipment delivery (or upon notification of ready and holding) 10% upon start-up or within six (6) months from delivery, whichever first
<b>FREIGHT:</b>	Included in proposal	
<b>SUBMITTAL:</b>	2 to 4 weeks after release of order	
<b>DELIVERY:</b>	20 weeks after receipt of approved	
<b>SITE START-UP:</b>	Included	
<b>TRAINING:</b>	Included	
<b>PRICE:</b>	Equipment	\$248,000
	START UP	\$7,250
	SPARES	\$1000
	SHIPPING CRATES	\$3,500
	<b>TOTAL</b>	<b>\$259,750</b>

## Items not included in our scope

- Ventilation/air conditioning of shelter for electrical cabinet(s) to maintain indoor temperature below 104 F (if applicable; see actual temperature limit for control cabinet).
- Structure above UV modules to protect from direct heat as well as from inclement weather.
- Mechanical installation labor for installing equipment, cabling and instrumentation.
- Lightning surge protection and electrical ground connection.

- e) Valves for isolation of individual systems for dose pacing and/or maintenance/cleaning purposes
- f) Unloading of components supplied by GLASCO UV.
- g) Placement in storage of all components supplied by GLASCO UV.
- h) All required equipment, labor, analysis, etc. for any on-site biological performance tests that may be required (regular support for operational tests is provided).
- i) Supply and installation of electrical conduit and wiring for power supply and controls of UV system.
- j) Any civil and/or mechanical work required to support or install the UV system or its associated controls. This includes concrete pads.
- k) Power surge protection and lightning strike protection devices to be provided by contractor.
- l) All transformers, circuit breakers and disconnect devices prior to the UV system enclosures are to be provided by electrical contractor (in some cases the transformer is provided by Glasco).
- m) Labor and installation of UV modules, electrical enclosures, compressor and PLC.
- n) Contractor to supply stainless steel anchor bolts for component installation.
- o) Sun shields for all electrical enclosures. This is to prevent thermal gain resulting from exposure to direct sunlight. (Not needed if installed indoors)
- p) If supplied, remote signal communication to the SCADA system including language/protocol conversion software and hardware as required. Data retrieval of information from the PLCs is the responsibility of the SCADA system provider or integrator. This includes integration of flow signals.

## Warranty

The warranty period is 18 months from date of delivery and 12 months from date of the Certification of Substantial Completion whichever comes first. It covers all failures due to defects in material and/or workmanship excluding consumables (see separate lamp and ballast warranties below).

This warranty shall not apply to any failure or defect which results from the Equipment not being operated and maintained in strict accordance with instructions specified in Glasco UV's Instructions Manual or which results from mishandling, misuse, neglect, improper storage, improper operation of the Equipment with other equipment furnished by the Customer or by other third parties or from defects in designs or specifications furnished by or on behalf of the Customer by a person other than Glasco UV. In addition, this warranty shall not apply to Equipment that has been altered or repaired after start-up by any one except:

- Authorized representatives of Glasco UV, or
- Customer acting under specific instructions from Glasco UV.

Customer must notify Glasco UV in writing within 5 days of the date of any Equipment failure. This notification shall include a description of the problem, a copy of the operator's log, a copy of the Customer's maintenance record and any analytical results detailing the problem. If Customer has not maintained the operator's log and maintenance record in the manner directed in the Operation and Maintenance manual, or does not notify Glasco UV of the problem as specified above, this warranty may, in Glasco UV's discretion, be invalid.

Customer will fully cooperate with Glasco UV, in the manner requested by Glasco UV, in attempting to diagnose and resolve the problem by way of telephone support. If the problem can be diagnosed by telephone support and a replacement part is required, Glasco UV will either, at Glasco UV's expense, ship a repaired, reworked or new part to the Customer who will install such part as directed by Glasco UV or will direct Customer to acquire, at Glasco UV's expense, such part from a third party and then install such part as directed by Glasco UV.

This warranty is the exclusive remedy of the Customer for all claims based on a failure of or defect in the Equipment, whether the claim is based on contract (including fundamental breach), tort (including negligence), strict liability or otherwise. This warranty is lieu of all other warranties whether written, oral, implied or statutory. Without limitation, no warranty of merchantability or fitness for a particular purpose shall apply to the Equipment.

### Lamp Warranty

Each low pressure, high output lamp is guaranteed for 13,000 hours operating time under normal operating conditions. Normal operating conditions include:

- On/off cycles max. 4 per 24 operating hours,
- Voltage fluctuations according to DIN IEC 38.

In case of premature lamp failure, the client is requested to send the lamp back to Glasco UV together with the information of UV unit serial number, hours run and on/off cycles. Glasco UV then offers the following:

- Lamp failure before 9,000 h: Glasco UV will send a replacement lamp free of charge,
- Lamp failure after 9,000 h: Glasco UV will issue a credit proportional to the hours not used.

Upon return to our facilities in Mahwah, NJ, we will dispose/recycle all used and failed lamps at no charge to the client.

## Terms & Conditions

1. Applicable Terms. These terms govern the purchase and sale of the equipment and related services, if any (collectively, "Equipment"), referred to in Seller's purchase order, quotation, proposal or acknowledgment, as the case may be ("Seller's Documentation"). Whether these terms are included in an offer or an acceptance by Seller, such offer or acceptance is conditioned on Buyer's assent to these terms. Seller rejects all additional or different terms in any of Buyer's forms or documents.
2. Payment. Buyer shall pay Seller the full purchase price as set forth in Seller's Documentation. Unless Seller's Documentation provides otherwise, freight, storage, insurance and all taxes, duties or other governmental charges relating to the Equipment shall be paid by Buyer. If Seller is required to pay any such charges, Buyer shall immediately reimburse Seller. All payments are due within 30 days after receipt of invoice. Buyer shall be charged the lower of 1 ½% interest per month or the maximum legal rate on all amounts not received by the due date and shall pay all of Seller's reasonable costs (including attorneys' fees) of collecting amounts due but unpaid. All orders are subject to credit approval.
3. Delivery. Delivery of the Equipment shall be in material compliance with the schedule in Seller's Documentation. Unless Seller's Documentation provides otherwise, Delivery terms are F.O.B. Seller's facility.
4. Ownership of Materials. All devices, designs (including drawings, plans and specifications), estimates, prices, notes, electronic data and other documents or information prepared or disclosed by Seller, and all related intellectual property rights, shall remain Seller's property. Seller grants Buyer a non-exclusive, non-transferable license to use any such material solely for Buyer's use of the Equipment. Buyer shall not disclose any such material to third parties without Seller's prior written consent.
5. Changes. Seller shall not implement any changes in the scope of work described in Seller's Documentation unless Buyer and Seller agree in writing to the details of the change and any resulting price, schedule or other contractual modifications. This includes any changes necessitated by a change in applicable law occurring after the effective date of any contract including these terms.
6. Warranty. Subject to the following sentence, Seller warrants to Buyer that the Equipment shall materially conform to the description in Seller's Documentation and shall be free from defects in material and workmanship. The foregoing warranty shall not apply to any Equipment that is specified or otherwise demanded by Buyer and is not manufactured or selected by Seller, as to which (i) Seller hereby assigns to Buyer, to the extent assignable, any warranties made to Seller and (ii) Seller shall have no other liability to Buyer under warranty, tort or any other legal theory. If Buyer gives Seller prompt written notice of breach of this warranty within 18 months from delivery or 1 year from acceptance, whichever occurs first (the "Warranty Period"), Seller shall, at its sole option and as Buyer's sole remedy, repair or replace the subject parts or refund the purchase price therefore. If Seller determines that any claimed breach is not, in fact, covered by this warranty, Buyer shall pay Seller its then customary charges for any repair or replacement made by Seller. Seller's warranty is conditioned on Buyer's (a) operating and maintaining the Equipment in accordance with Seller's instructions, (b) not making any unauthorized repairs or alterations, and (c) not being in default of any payment obligation to Seller. Seller's warranty does not cover damage caused by chemical action or abrasive material, misuse or improper installation (unless installed by Seller). THE WARRANTIES SET FORTH IN THIS SECTION ARE SELLER'S SOLE AND EXCLUSIVE WARRANTIES AND ARE SUBJECT TO SECTION 10 BELOW. SELLER MAKES NO OTHER WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE.
7. Indemnity. Seller shall indemnify, defend and hold Buyer harmless from any claim, cause of action or liability incurred by Buyer as a result of third party claims for personal injury, death or damage to tangible property, to the extent caused by Seller's negligence. Seller shall have the sole authority to direct the defense of and settle any indemnified claim. Seller's indemnification is conditioned on Buyer (a) promptly, within the Warranty Period, notifying Seller of any claim, and (b) providing reasonable cooperation in the defense of any claim.
8. Force Majeure. Neither Seller nor Buyer shall have any liability for any breach (except for breach of payment obligations) caused by extreme weather or other act of God, strike or other labor shortage or disturbance, fire, accident, war or civil disturbance, delay of carriers, failure of normal sources of supply, act of government or any other cause beyond such party's reasonable control.
9. Cancellation. If Buyer cancels or suspends its order for any reason other than Seller's breach, Buyer shall promptly pay Seller for work performed prior to cancellation or suspension and any other direct costs incurred by Seller as a result of such cancellation or suspension.
10. LIMITATION OF LIABILITY. NOTWITHSTANDING ANYTHING ELSE TO THE CONTRARY, SELLER SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, PUNITIVE OR OTHER INDIRECT DAMAGES, AND SELLER'S TOTAL LIABILITY ARISING AT ANY TIME FROM THE SALE OR USE OF THE EQUIPMENT SHALL NOT EXCEED THE PURCHASE PRICE PAID FOR THE EQUIPMENT. THESE LIMITATIONS APPLY WHETHER THE LIABILITY IS BASED ON CONTRACT, TORT, STRICT LIABILITY OR ANY OTHER THEORY.
11. Reservation Clause. Buyer acknowledges that Seller is required to comply with applicable export laws and regulations relating to the sale, exportation, transfer, assignment, disposal and usage of the Equipment provided under this Agreement, including any export license requirements. Buyer agrees that such Equipment shall not at any time directly or indirectly be used, exported, sold, transferred, assigned or otherwise disposed of in a manner which will result in non-compliance with such applicable export laws and regulations. It shall be a condition of the continuing performance by Seller of its obligations hereunder that compliance with such export laws and regulations be maintained at all times. BUYER AGREES TO INDEMNIFY AND HOLD SELLER HARMLESS FROM ANY AND ALL COSTS, LIABILITIES, PENALTIES, SANCTIONS AND FINES RELATED TO NON-COMPLIANCE WITH APPLICABLE EXPORT LAWS AND REGULATIONS.
12. Miscellaneous. If these terms are issued in connection with a government contract, they shall be deemed to include those federal acquisition regulations that are required by law to be included. These terms, together with any quotation, purchase order or acknowledgement issued or signed by the Seller, comprise the complete and exclusive statement of the agreement between the parties (the "Agreement") and supersede any terms contained in Buyer's documents, unless separately signed by Seller. No part of the Agreement may be changed or cancelled except by a written document signed by Seller and Buyer. No course of dealing or performance, usage of trade or failure to enforce any term shall be used to modify the Agreement. If any of these terms is unenforceable, such term shall be limited only to the extent necessary to make it enforceable, and all other terms shall remain in full force and effect. Buyer may not assign or permit any other transfer of the Agreement without Seller's prior written consent. The Agreement shall be governed by the laws of the State of New Jersey without regard to its conflict of laws provisions.

# NONCON

## S E R I E S



### PRODUCT OVERVIEW

The “**NONCON 5000**” Series is a “flow through” fluoropolymer style of ultraviolet (UV) water and wastewater disinfection systems.

Unlike our other systems where the UV lamps are immersed in the water (using protective quartz sleeves), the “NONCON 5000” uses non conductive transparent fluoropolymer tubes to transport the water close to the UV lamps.

The UV lamps are positioned in the air and shine germicidal rays (@ 254 nm) through the fluoropolymer tubes directly at their intended targets, microorganisms. Lamps are not in the water.

### STANDARD FEATURES

- Stainless steel disinfection reactor **OR**
- Open channel insert for large flows
- Low-pressure high-output UV lamps
- Fluoropolymer flow through tubes
- Multi-voltage power (120-277)
- UV monitoring
- Lamp status and run time indicators
- 45 psi pressure-rated
- Remote electronics
- Environmental temperature management
- Air release valves
- Drain ports

NONCON 5000



GLASCO UV



## <sup>11</sup> NONCON UV DISINFECTION SYSTEMS

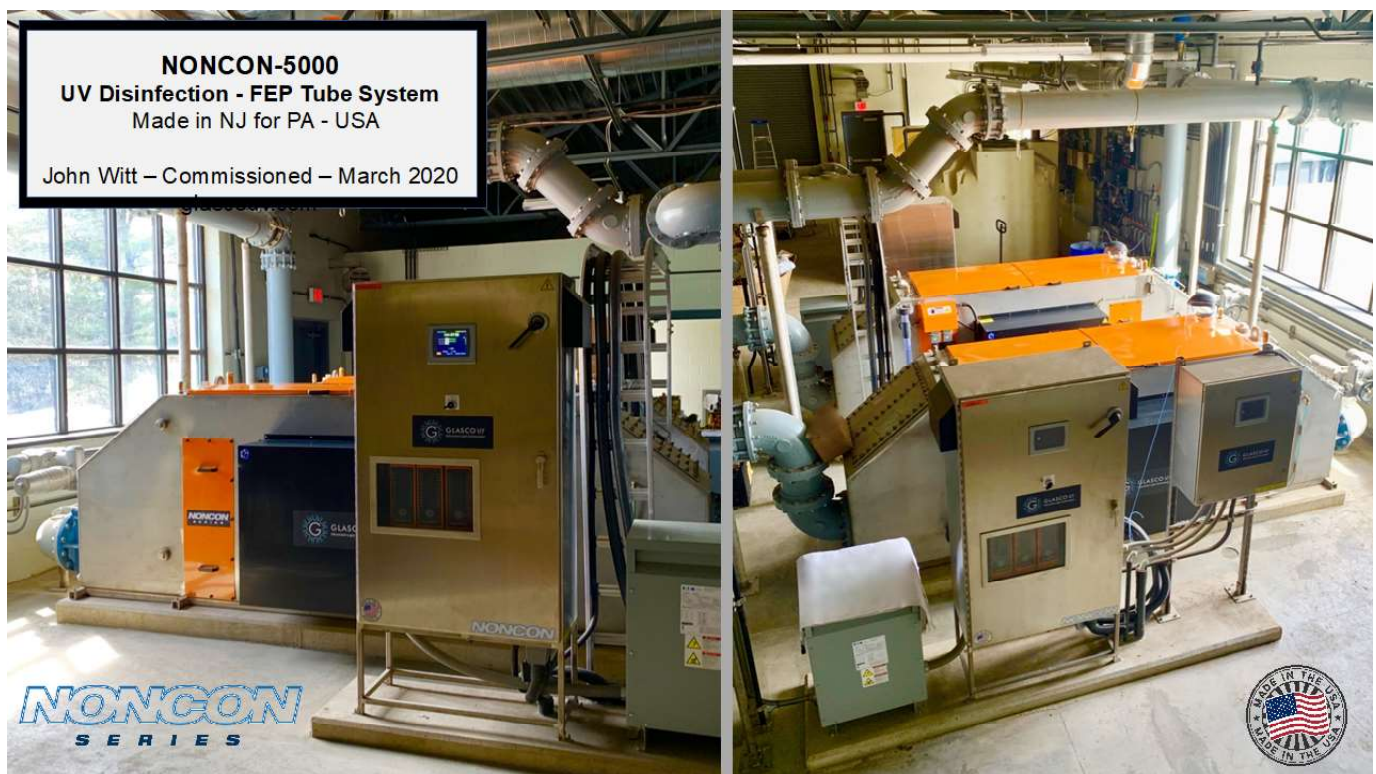
Systems use special fluoropolymer (FEP) tubes to transport water, wastewater and other liquids in close proximity to the UV lamps. The fluoropolymer tubes are transparent and allow UV light in the 254 nm range to penetrate the tube's walls and disable microorganisms. Lamps are positioned around the tubes in a reflective reactor.

The tubes are manufactured in the United States from a high quality polymer resin. The tubes, which are highly transparent, are neutrally charged (the “**non-conductive**” in “NONCON”) and thus, not susceptible to fouling and scaling from positively charged minerals. In traditional UV systems, the quartz sleeves need to be cleaned.

Over 100 years ago, scientists found that when pathogens were exposed to UV light, their reproduction was limited. The light resided in the UVC range of the spectrum. Specifically, they discovered that light in the 254 nanometer (nm) range was the most effective. When pathogens are exposed to UV light, their cells become damaged and this inhibits reproduction. UV light damages the cell's DNA and RNA and once damaged, they are unable to replicate and therefore, rendered harmless.

The amount of damage is a result of the intensity of the UV light multiplied by the time the water is exposed to the light (time x intensity). The dosage, referred to as microwatts, is often expressed as mJ/cm<sup>2</sup>. Doses > 30,000 microwatt dose (30 mJ) are accepted for wastewater disinfection.

NONCON 5000<sup>2</sup>



GLASCO UV

[www.glascouv.com](http://www.glascouv.com)



CLICK ON PICTURE FOR  
VIDEO

**VIDEO!**



GLASCO UV

## NONCON OPERATION

Facility connects to the “NONCON” reactor via flange or in the case of larger projects, directly into a poured concrete channel. Water or wastewater enters a pressurized transition box and then feeds into a bank of transparent tubes. Water and wastewater travels through the tubes and exits into the discharge pressure box. Tubes are rated at 45 psi.

Systems are designed based on a peak flow rate, a UV transmission percentage (UVT%) and information related to the plant's discharge permit. The number of tubes and associated UV lamps are based on the biological testing (bioassay) testing and computational fluid dynamic (CFD) modeling.



[www.glascouv.com](http://www.glascouv.com)



GLASCO UV

**NONCON 5000**



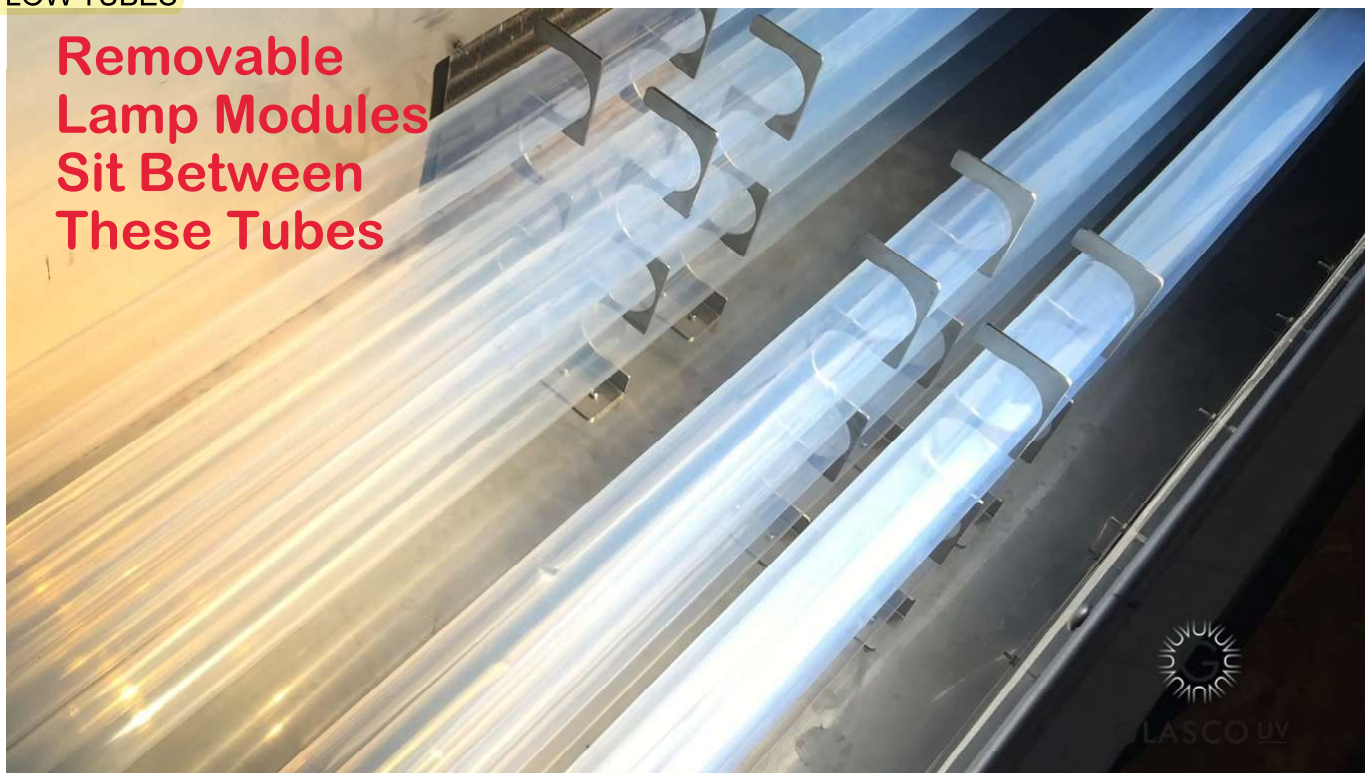


## NONCON OPERATION (SYSTEM CONTROLS)

NONCON uses a remote Ballast Control Center (BCC). This stainless steel enclosure provides a single point of control for operators and removes sensitive components from reactor, which may be damaged in the event of moisture or flooding. The BCC houses ballasts, power controls, operating displays and UV monitor in a controlled environment. NONCON lamps (low-pressure high-output) are sensitive to temperature. To maintain optimal lamp temperature, reactor will be provided with a heat exchanger. The lamp drivers (ballast) are configured in easy to manage trays. The ballast trays are removable, and interchangeable making for easy maintenance, and trouble shooting.

## FLOW TUBES

**Removable  
Lamp Modules  
Sit Between  
These Tubes**



**NONCON 5000**

126 Christie Avenue, Mahwah, NJ 07430

• phone: 201-934-3348 fax: 201-934-3388 •

info@glascouv.com

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www.glascouv.com

A-NONCON-052016



Proposal (Romeo Vela)

Gardner Kansas

March 02, 2021

NONCON-5000-8-11X60 (2)

Ultraviolet Disinfection Equipment

Part 1 General

#### 1.1 Definitions

- A. The definitions below pertain to this technical specification and do not alter any definitions provided in other technical specifications.
  - 1. The owner is the city of Gardner, Kansas.
  - 2. The project is the Kill Creek Wastewater Treatment Plant.
  - 3. The site is Gardner, Kansas
  - 4. The Engineer is Glasco UV.
  - 5. The Supplier is Glasco UV.

1.2 The CONTRACTOR is the firm contractually bound to the OWNER for providing and installing equipment and materials for the PROJECT specified in project documents.

#### 1.3 Work Included

- A. The CONTRACTOR shall furnish and install a complete flow through FEP tube reactor ultraviolet disinfection system as described in this specification and as shown on the drawings. The CONTRACTOR shall be responsible for equipment installation per directions of Glasco UV. Glasco UV will be responsible for verification of system installation, start-up, testing, and operation and maintenance training of the OWNER's personnel.
- B. Glasco UV shall guarantee that the system shall be capable of disinfecting a maximum effluent flow of 9 MGD as described in the water characteristics in Section 2.3 OPERATING PARAMETERS., to reduce fecal coliform levels to a maximum of 200 CFU/100mL. The system shall consist of two horizontal closed vessel operating units each capable of treating 4.5 MGD.

Part 2 Materials

#### 2.1 General

- A. The CONTRACTOR shall furnish and install a complete flow through FEP tube reactor ultraviolet disinfection system as described herein. The system shall include two (2) flow through FEP tube reactors each containing 155-Watt high output lamps/60 FEP tubes and a) combined ballast control/system control enclosure. The CONTRACTOR shall physically install the disinfection reactors, and ballast control/system control enclosures according to Glasco UV's directions and drawings. The CONTRACTOR shall provide the power source, electrical conduit, power supply and control conductors to the ballast control/system control, and equipment base supports. The CONTRACTOR shall provide electrical conduit between the ballast control/system control enclosure and UV units. Glasco UV shall provide, install and terminate all interconnecting cables between the ballast control/system control enclosure and the UV chambers, and shall also be

responsible for verification of installation including electrical hookup of equipment, start-up, and testing.

B. Training

1. The CONTRACTOR shall be responsible for all costs providing Glasco UV's representative training for the OWNER's operation personnel.

## 2.2 Acceptable Supplier

- A. Glasco UV's NONCON based series of flow through FEP TUBE disinfection reactors have been installed in multiple locations over the last fifteen plus years

## 2.3 Operating Parameters

A. Effluent Parameters:

1. Fluid Evaluation: 62% transmission
  2. BOD (5 Day): <30 mg/L
  3. Total Suspended Solids: <30 mg/L
  4. Fecal Coliform Count: 200/100 mL
  5. Maximum Flow Rate: 9 MGD total (4.5 MGD per reactor)
  6. Minimum Water Temperature: 33°F
  7. Maximum Water Temperature: 90°F
  8. Maximum Allowable Headloss Through Chamber: 9.068" (Per Reactor)
  9. Minimum UV Dose 29.583 mJ/Cm<sup>2</sup> (At end of Lamp Life)
- B. Lamp Life shall be guaranteed for 13,000 hours on a pro-rated basis. End of Lamp life shall be defined to be when UV output of the lamp has decreased by 30%

## 2.4 Ultraviolet Disinfection Reactors

A. FEP Tube UV Reactor

1. All module welded metal components in contact with effluent will be Type 304L/316L, fluoropolymer and other non corrosive materials.
2. All metal components will be Type 304 stainless steel with the exception of the Lamp Rack Assembly, which will be constructed of aircraft grade aluminum and be capable of sustaining intermittent pedestrian traffic on the lamp racks.
3. All wiring exposed or unexposed to UV light within the UV reactor or electrical ballast enclosure will be Teflon™ coated.
4. All wires connecting the lamps to the ballasts will be enclosed inside the frame of lamp rack and not exposed to the effluent.
5. The effluent water will be conveyed through the UV reactor through fluoropolymer tubes. All wetted components in the UV reactor will be: FEP, 304SS, PVC, ABS or other non-reactive, non-corrosive material.
6. Within the ultraviolet reactor, FEP UV transmitting tubes are arranged in a horizontal and vertical array. These FEP tubes are in a parallel mode and are attached at one end to the inlet flow distributor sheet and to the outlet flow distributor sheet with appropriate leak proof fittings. The FEP tubes will be adequately supported by integral mounting brackets.
7. The FEP tubes will be supported by aluminum holding structures.

8. In between and around the FEP tubes, lamp rack assemblies will be placed in such a fashion so as to provide uniform and adequate ultraviolet light intensity. The lamp racks slide in and out between and around a row of FEP tube array.
9. Within the FEP UV reactor, all UV sensitive materials will be protected from the UV light.
10. The flow path of the wastewater will be through UV transmitting FEP tubes in such a way that it is a minimum of 99% plug flow.
11. The flow of wastewater will be in sufficient turbulent mode; therefore, the Reynold's number in each unit will be greater than 50,000 at peak daily flow. A turbulent flow will be in such a way that it will constantly scour the inner walls of the AFP tube and help prevent scaling or fouling.
12. The ultraviolet light reactor will be covered from five sides with stainless panels. The sixth side (top) will have access doors. The lamp racks will be accessible through these doors.
13. The NONCON reactors have hinged covers that shut off the system when lifted.
14. The air temperature inside the FEP UV reactor will be maintained by means of heat exchanger. The control of the lamp temperature will ensure optimum UV light emissions from the UV lamp. The heat exchanger will ensure that no outside air or dust can get into the UV reactor and settle on the AFP tubes and UV lamps. Temperature will be 107
15. Cooling of the UV reactor will utilize an air to air heat exchanger.
16. Each UV Reactor will consist of 1 bank configured.
17. Flow tube quantity 60 tubes per unit.
18. 11 Racks of UV lamps each with 8 lamps will be required. A total of 88 lamps per bank with a total project of 176 lamps.

B. UV Lamps

1. UV lamps are low pressure high output type and operate at 155 watts. Lamps are available from Light Sources, Inc (CT USA) and Hereaus Noblelight (GERMANY).
2. A low pressure, high output non-amalgam mercury vapor lamp of the hot cathode type. Lamp is the GH064T5L.
3. The filament will be of the clamped design, significantly rugged to withstand shock and vibration.
4. Each lamp will produce at least 90% emissions at the germicidal frequency of 253.4 (254nm) nanometers.
5. The power consumption will be a maximum of 155 input watts per lamp including ballast losses.
6. The rated UV output at 253.7 nanometers will be a nominal 52 UV254
7. The rated UV efficiency will be a nominal 32% of actual lamp input wattage exclusive of ballast losses.
8. Watts at 100 hours of operation.
9. The minimum UV intensity from the lamps will be >400 microwatts/cm<sup>2</sup> at 1 meter.
10. Rated lamp life is 13,000 hours
11. Each lamp will be single ended. Each lamp will have a nominal arc length of 140 millimeters.
12. Each lamp has a minimum length of 1554 mm.
13. Each lamp will produce no measurable amount of ozone.
14. Each lamp envelope is made of quartz and is capable of transmitting at 90% of UV light at 254 nm.

15. UV lamp base will be either ceramic or metallic
  16. Electrical connections will be at one end of the lamp and have 4 pins, dielectrically tested for 2,500 volts.
  17. During periods in the process when there is no effluent flow going through the UV reactor(s) the UV lamps will be turned off.
- C. UV Intensity Monitor
1. One (1) UV module in each UV reactor will be equipped with an ultraviolet intensity monitor system.
  2. The intensity sensors will be placed around a representative lamps around a FEP tube.
  3. The UV sensors will sense 253.7 nm UV light and will provide a signal which will be displayed on the system display panel.
  4. UV sensor is solar blind.
  5. UV sensor has a 4-20 mA signal which can be read remotely.
- D. Automatic Cleaning Mechanism
1. Glasco UV shall not provide an automatic cleaning mechanism as it not required for the FEP tube reactor design.
- E. Temperature Sensor
1. A high heat shut off sensor shall be incorporated into each of the reactors for protection against heat buildup under no glow or drained chamber conditions. UV system to shut down and alarm in event of wither of the above mentioned conditions.
- F. Fluoropolymer Tube
1. The system will incorporate high clarity fluoropolymer tubing. The tubes are made in the USA from virgin grade fluoropolymer resins.
  2. Resin material is high clarity in the UVC range. This is the peak transmittance range for UV lamps to penetrate.
  3. Tubes are rated from -99F to 450F.
  4. Tubes are crack resistant.
  5. FEP tubes are inert and resistant to chemicals and solvents.
  6. FEP tubes are electrically neutral. This lack of "charge" eliminates the plating and fouling most often associated with GE TYPE 214 quartz.
- G. Inlet/Discharge Flow Distribution Boxes
1. Reactor will have an inlet and discharge transition tanks. Tanks will be made from ¼" stainless steel with a removable access hatch at both ends.
  2. The UV system will have 18" flange patterns on the inlet and outlet boxes.
  3. The UV disinfection system will have flow inlet distribution that distributes wastewater through the FEP tubes.
  4. The UV system will have a 304 Stainless steel channel and will be non-corrosive.
  5. Transition boxes to have 2" FNPT couplings to be used as venting and vacuum relief ports for vent stacking.
- H. Lamp Array Configuration
1. The lamp array configuration will be the uniform array with all lamps parallel to each other and to the flow.

2. The system is designed to avoid any immersion of UV lamps in the Effluent. The UV lamps will be arranged around the outside of the FEP tubes in such a way that each water tube will have no less than 6 lamps irradiating it.
- I. UV Lamp Module Assembly
  1. The UV lamp racks will be placed between rows of the FEP tubes.
  2. The lamp racks will slide in and out within a track that will be attached to the main frame of the UV reactor.
  3. The use of cranes, hoists or other mechanical lifting devices is not required.
  4. The lamp rack assemblies will be made from stainless steel.
  5. Lamp rack assembly is capable of sustaining intermittent pedestrian traffic on the lamp racks with no damage or deformation.
  6. There are no quartz sleeves, O rings, Seals or waterproof connections required for installing UV lamps onto the lamp rack assembly.
  7. Electrical mounting sockets are attached to one end of the lamp rack.
  8. The other end of the rack are slotted holes to slide lamps in and out during installation and removal of lamps.
  9. Quick power disconnects will allow quick disconnect of the lamp rack assembly to the main power.
  10. Lamp Racks are removable for service during plant operation without impacting Hydraulic flow or effective disinfection.
  11. Removing a lamp rack or module does not result in the disruption of the hydraulic flow.
  12. Ballast required for each lamp rack will be incorporated in the Ballast Control Center.

## 2.5 UV Spectrophotometer

- A. A separate spectrophotometer will be provided by the UV equipment Glasco UV to be used in the lab to determine the transmission value of the plant's effluent. The UV spectrophotometer will remain the property of the OWNER.
- B. The unit shall be a Real Tech UV254 P200 Photometer

## 2.6 Power/Control Equipment

- A.
  1. Glasco shall provide a combined ballast control center & system control center.
  2. The combined BCC/SCC will be constructed of stainless steel material and will be by Hoffman.
  3. A circuit breaker will be supplied with an external handle as to allow for system shutdown without opening the enclosure.
- B. Power Requirements
  1. Electrical supply to the combined BCC/SCC will be 480V 3-phase.
  2. Glasco will provide a stepdown transformer to lower the voltage to 230V.
- C. Ballast Control Center
  1. Glasco incorporates a combined ballast/system control center to operate the 88 lamps in each of the two (2) reactors.
- D. System Control Center

1. Glasco incorporates a combined ballast/system control center to operate the 88 lamps in each of the two (2) reactors. The combined enclosure shall contain the following controls and displays:
  - a. Lamp status indicator to verify each lamp is on.
  - b. LED UV intensity readout (%) with a "low UV" indicator.
  - c. Hours run meter.
  - d. Remote on/off cutout for external control of the respective lamp group.
  - e. Circuit breaker protection of incoming circuits.
  - f. Ground fault protection of lamp circuits.
  - g. Enclosure and chamber over-temperature protection.
  - h. Control of automatic cleaning mechanism, if fitted.

## 2.7 Section skipped in original specifying document

## 2.8 Monitoring/Interfacing and Control Requirements

- A. The combined ballast control/system control enclosure shall contain the following signal for remote monitoring and input signals for each reactor:
  1. Chamber Running -- dry contact which closes when the cluster is energized.
  2. Chamber High Temperature -- dry contact which closes if the lamp group has shut down due to the following: chamber temp >113 deg F, cabinet temp >158 deg F.
  3. Lamp Out--Dry contact which closes for the following: low UV, or lamp burnt out.
  4. Chamber Transmittance 4-20 mA analog signal corresponding to the output of the UV intensity monitor (inline with the UV monitor). This may be connected to a measuring device with a maximum 250 ohm input impedance.
  5. Chamber Ground Fault Detection--A dry contact which opens when the lamp group is shut down due to ground fault.
  6. Wiper Malfunction--a dry contact which closes if the cleaning mechanism malfunctions.
- B. Control Scheme-Flow Pacing:
  1. The UV system remote control and indication shall be via the Treatment Train Remote I/O Cabinet (TT1RI/O) located inside the Blower Building. The I/O board will be connected to the main PLC that is incorporated in the Plant's SCADA system. Automation of the UV disinfection process will be accomplished using the effluent flow meter, located at the UV Building, to flow pace the UV equipment and control the On/Off operation for each bank of bulbs.
  2. A 4-20 mA signal will be input into the SCADA system from the effluent flow meter. Based upon the instantaneous flow rate the, the SCADA system shall be programmed to either start or stop a lamp group(s), or open or close a motor operated weir gate to allow flow to enter the required UV chamber(s). The UV chambers shall be setup for a lead-lag-type operation. After each 7-day period the lead chamber will switch to help ensure uniform lamp usage between the different UV chambers. When the lag UV chamber is brought online due to high flows, the lag lamp group(s) shall be energized upon the initiation of the opening of the lag weir gate. De-energizing of the last bank of bulbs shall be initiated upon closure of the lag weir gate. Each UV chamber shall be equipped with floating-ball-type level switches as shown on the drawings. These switches are provided and installed by others.

The signal from the switches shall be input into the UV control panel and There shall be a permissive for energizing the UV bulbs. The float switches are intended to ensure that the UV bulbs are not energized until after full immersion. 120VAC, 1PH interrogation voltage for the switches shall be from the UV control panels, and closure of the switch contact shall be a necessary permissive for lamp energization.

**3. The following flow pacing scheme shall be programmed into the SCADA control system:**

Our NONCON reactors will be energized at full power when their associated gate is open. Glasco UV cannot shut groups of lamps in individual reactors because all of the tubes will be flooded at all times. The Glasco UV PLC will lead lag between chambers, lead lag timing will be operator defined at the panel.

FLOW MGD	POWER SET POINT	CHAMBER ONE	CHAMBER TWO	SCADA WEIR GATE(S) CONTROL
0-3.0	100%	ON	OFF	OPEN/SHUT
3.1-4.5	100%	ON	OFF	OPEN/SHUT
4.5-6.00	100%	ON	ON	OPEN/OPEN
6.0-9.0	100%	ON	ON	OPEN/OPEN

## 2.9 Spare Parts

- A. The Following Spare parts shall be included as part of the equipment to be supplied:
1. Eight (8) Lamps
  2. Four (4) FEP Tubes
  3. Two (2) Ballasts

## Part 3 Warranties

Glasco UV Shall provide a written warranty that provides for

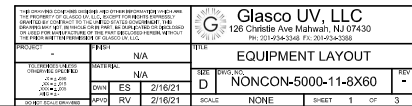
1. The SYSTEM shall be free from defects in materials and workmanship for a period of 12 months from Final Acceptance of the system, or 18 months from shipment, whichever occurs first.
2. Lamps shall be warranted for a period of 13,000 hours operating time under normal operating conditions.
3. The lamp warranty shall cover the full replacement cost for the first 1,000 hours of operation.
4. The lamp warranty shall cover the lamp replacement cost on a prorated basis after 1,000 hours operation.

## Part 4 Start Up

- A. Glasco UV will provide start up services.
- B. Glasco UV will sign off on forms provided that indicate contractor installed and configured UV disinfection system in a proper manner.
- C. Glasco shall provide the minimum:
1. One (1) day for installation support
  2. One (1) day testing

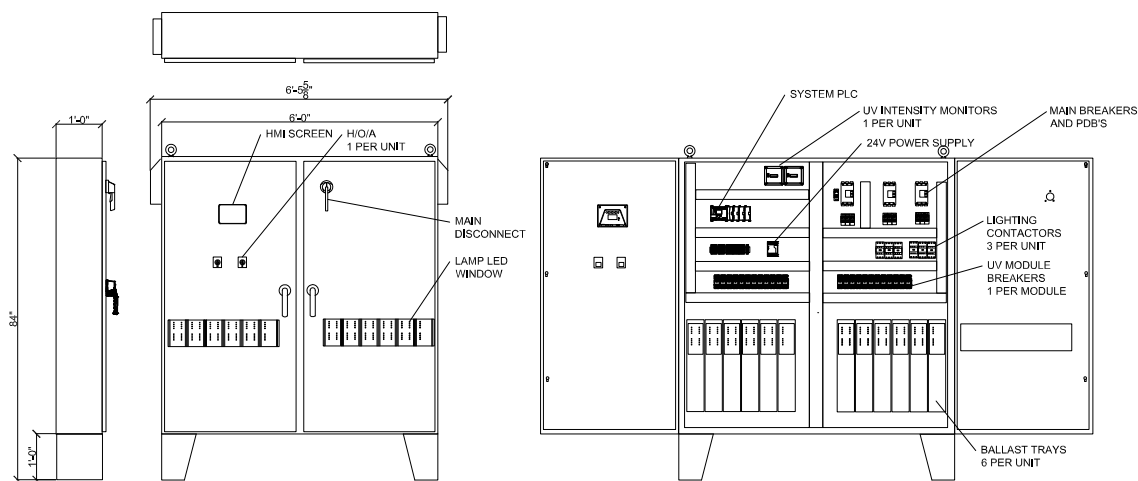
3. One (1) Day for classroom training.






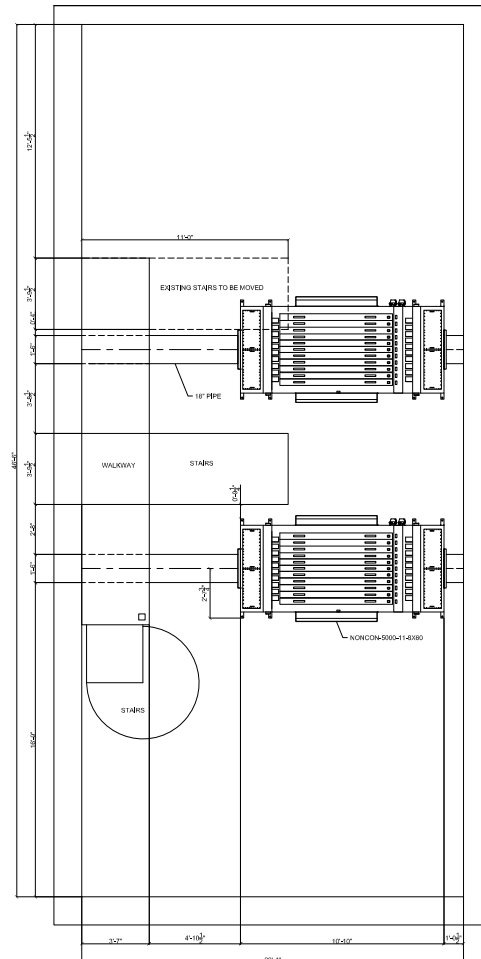
REV	DESCRIPTION	DATE	APPROVED
-----	-------------	------	----------

To be located on ground level of the UV building, replacing existing control panels



<small>THESE DRAWINGS ARE THE PROPERTY OF GLASCO UV, LLC. NO PART OF THESE DRAWINGS MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, WITHOUT THE WRITTEN PERMISSION OF GLASCO UV, LLC.</small>				<div><b>Glasco UV, LLC</b> 120 Christie Ave Mahwah, NJ 07430 PH: 201-646-3348 FX: 201-646-3389</div>	
<b>ENCLOSURE LAYOUT</b>					
DATE: 2/16/21	BY: ES	DATE: 2/16/21	BY: RV	SCALE: NONE	SHEET 2 OF 3

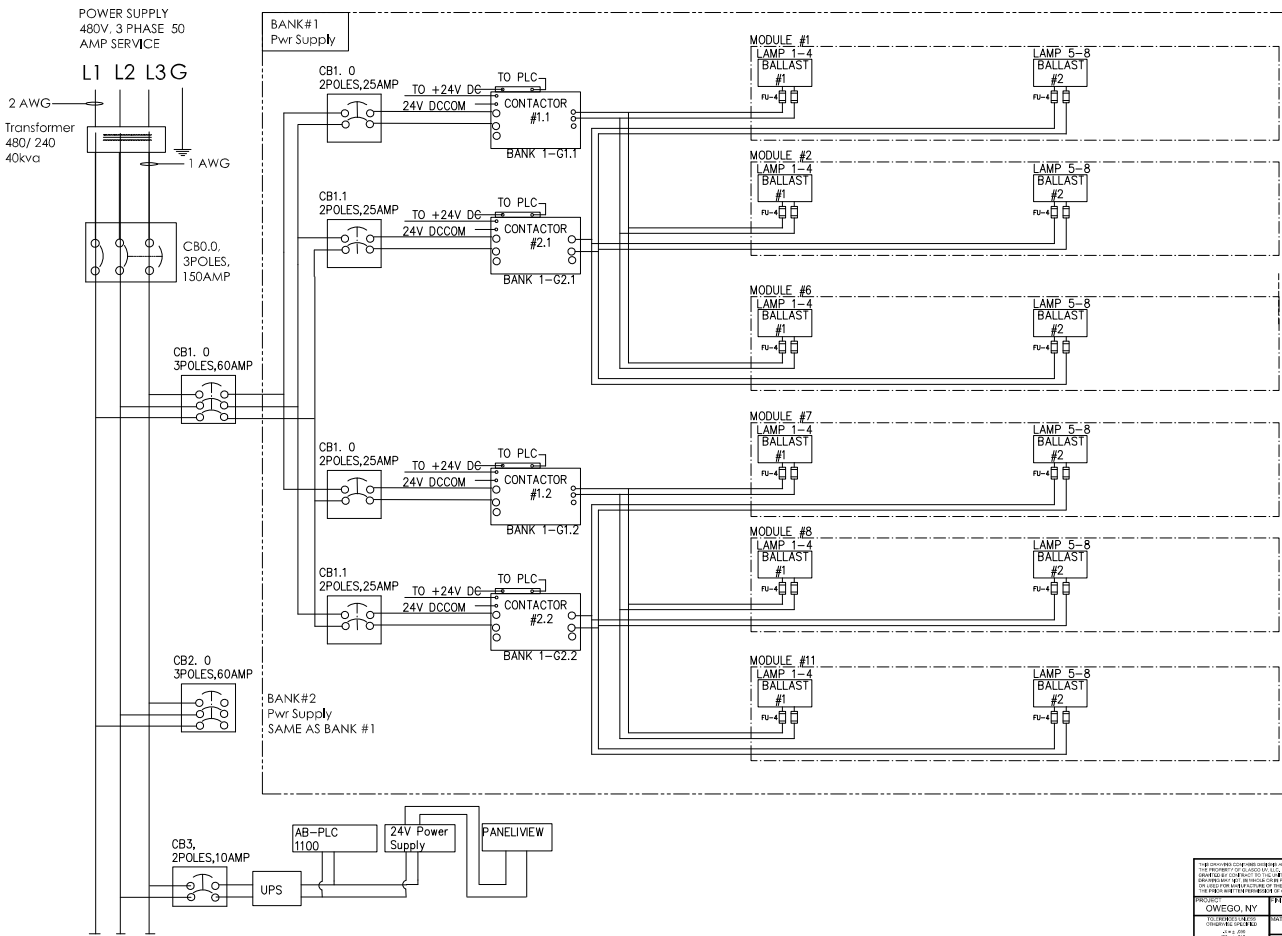
### Top View of UV Room



**Also see Note on bottom left of page.**

1. EXISTING EFFLUENT PIPING SHALL BE CUT TO THE DIMENSIONS SPECIFIED ON THE DRAWINGS BY OTHERS.

I hereby certify that the information furnished on this form is true and correct. I understand that this information will be used by the Federal Bureau of Investigation for the purpose of conducting a background check.		NTP ID: <b>G</b>		<b>Glasco UV, LLC</b> 126 Christie Ave Mahwah, NJ 07430 PH: (201) 444-3348 FX: (201) 444-3388	
<b>PROPOSED BY:</b>		<b>PROJECT:</b>		<b>TITLE:</b>	
PROJECT NO.:		N/A		<b>PIPING LAYOUT</b>	
DRAWING NO.:		N/A		<b>REV. NO.</b>	
DATE:		2/16/21		<b>NONCON-5000-11-8X60</b>	
SCALE:		NONE		SHEET 3 OF 3	



TECHNICAL DATA:  
Power Supply: 480V, 3 Phase,  
50 AMP Service  
Lamp Power: 155Watt  
Module in one Channel: 11X2  
Lamps Per Module: 8  
Total Lamps In System: 176  
System KVA: 29.5

<small>The undersigned hereby certifies that the information furnished herein is true and correct to the best of his knowledge and belief, and that he is not aware of any information that would cause the information furnished herein to be untrue or misleading in any material respect.</small>		<b>Glasco UV, LLC</b> 126 Christie Ave Mahwah, NJ 07430 PH: 201-426-2248 FX: 201-426-2289	
PROJECT <b>OWEGO, NY</b>	DATE <b>09/20/2018</b>	TITLE <b>POWER SUPPLY</b>	REV <b>3</b>
DRAWN <b>SM</b>	CHECKED <b>SM</b>	DATE <b>09/20/2018</b>	PROJECT NO. <b>2008-18276</b>
SCALE <b>NONE</b>	SHEET <b>1</b>	OF <b>5</b>	

GLASCO UV

# UV DYS DOSE CALCULATIONS

Peak FLOW 4.5 MGD

NONCON-50000-11-8 X 60

Calculated by: Romeo Vela Director of Engineered Products

3/1/2021

	<b>4 &lt;-type</b>	4176	Disinfection I	18.0779221	Vv(gal)	---			
GHO64	Lamp Style	58	Width (in) from LengthArc		16,787				
<b>52</b>	UVwatts (W), at 100hrs u	3	Length (in)	<--boundary (test point here)					
	58 LengthArc (in) to Width	24	Height (in)						
	31.8 (in)diam equiv.					4,576	uvWattsTotal		
<b>3</b>	Spacing in Height (in)	<b>0.94488</b>	Quartz OD (in)			24.96	Reactor Density (W/gal)		
<b>8</b>	LAMPS PER MOD.	325.36	Quartz Volume (Culn)			0.68	UV Load (GPM/W)		
<b>88</b>	Total(lamps)	3850.64	Void Vol (Culr	16.67	VoidVol(gal)				
<b>4,500,000</b>	Gallons Per Day			3,125.00	gpm				
<b>11</b>	MODULES	42357.1	Vv(cu.in)	183.36	Vv(gal)				
409,091	Flow (GPD) per rack								
284.09	Flow (GPM) per rack		<b>90%</b>	<b>% trans.,qtz</b>		<b>62%</b>	<b>UV Transmission %</b>		
4.73	Flow (GPS) per rack		<b>90%</b>	<b>Eff.,lamp</b>		0.204	absorbance unit/cm		
3.52	Retention Time (sec)	41.8453	Vel(cm/sec)	0.41845306		0.47	Absorption Coeff (1/cm)		
Module:									
Test Point on "Length" boundary, "even" with 2nd lamp...									
distance (in)	to lamp #:	x (in)	y (in)	I diss (W/SqIn)	I trans (W/SqIn)	Idiss* absorbed	Isum (W/SqIn)	Isum(uW/ Sqcm)	Dosage(u WSec/SqC m)
18.06	8	1.5	18	0.0	0.0	0.0	0.1	8,403	<b>29,583</b>

Dose achieved 29.6 mJ/cm2

GLASCO UV

# UV HEADLOSS CALCULATIONS

Peak FLOW 4.5 MGD

NONCON-50000-11-8 X 60

Calculated by: Romeo Vela Director of Engineered Products

3/1/2021

Total head-loss= 9.068"

MINOR LOSS					
GPM	Number of pipes	Pipe diameter (inches)	Minor loss coefficient	velocity (ft/s)	Head Loss (inches)
3125	1	18	1	3.940	2.895
3125	60	2.375	0.5	3.772	1.327
3125	60	2.375	1	3.772	2.654
3125	1	18	0.5	3.940	1.448
				Total Minor Loss (inches):	8.323
FRICTIONAL LOSS					
Length pip	Hazen-Williams cor	GPM through each tube	Inside hydraulic diameter (inches)	Friction loss (inches)	
7.145	150	52	2.875	0.745	
			Total frictional loss of system:	0.745	
Total Head	9.068				

NONCON REFERENCES

1. Lower Frederick WWTP: NOCON-5000-5-7X20  
Schwenksville, PA 19473  
Contact: Tom Manning  
Phone: 610-587-4261  
Install Date: 3/14/18  
Peak Flow: 1.4 MGD  
Upstream Treatment Process: SBR  
Approximate Run Hours: 25,872  
Disinfection Performance: Fecal Coliform 200/100 mL  
Corrective Maintenance: Standard lamp change after 12,000 hours
2. Newport Borough WWTP: NOCON-5000-5-12X40 (2)  
Newport, PA 17074  
Contact: Chris Burkholder  
Phone: 717-572-2911  
Install Date: March 17, 2020  
Peak Flow: 3 MGD (Per Reactor)  
Upstream Treatment Process: SBR  
Approximate Run Hours: 8,256  
Disinfection Performance: Fecal Coliform 200/100 mL  
Corrective Maintenance: Lead-lag bank operation no lamp change required yet
3. Owego WWTP: NOCON-5000-11-8X60  
Owego, NY 13827  
Contact: Chris Wood  
Email: woodc@hunt-eas.com  
Install Date: August 12, 2018  
Peak Flow: 4 MGD  
Upstream Treatment Process: SBR  
Approximate Run Hours: 22,248  
Disinfection Performance: Fecal Coliform 200/100 mL  
Corrective Maintenance: Added vent stacking & standard lamp change after 12,000 hours

4. Arrowhead Sewer Company: NONCON-5000-3-8-12  
Pocono Lake, PA 18347  
Contact: John Rehm  
Phone: 570-216-1612  
Install Date: 4/01/2015  
Peak Flow: 1.04 MGD  
Upstream Treatment Process: Purestream BESST System  
Approximate Run Hours: 51,744  
Disinfection Performance: 200/100 mL  
Corrective Maintenance:
5. Viton WWTP: NONCON-5000-6-8X30 (U)  
Viton, IA 52349  
Contact: Craig Walker  
Phone: 319-472-3353  
Install Date: 4/17/17  
Peak Flow: 5.0 MGD  
Upstream Treatment Process: Conventional activated sludge  
Approximate Run Hours: 33,816  
Disinfection Performance: Fecal Coliform 126/100 mL  
Corrective Maintenance: Standard lamp change after 12,000 hours
6. Gladbrook WWTP  
Gladbrook, IA 50635  
Contact: Mark Lowry  
Phone: 641-328-4467  
Install Date: 11/29/2016  
Peak Flow: 1.63 MGD  
Upstream Treatment Process: Lagoons  
Approximate Run Hours: 37,152  
Disinfection Performance: Fecal Coliform 126/100 mL  
Corrective Maintenance: Standard lamp change after 12,000 hours
7. Fairbank WWTP: NONCON-5000-3-5-8 (2)  
Fairbank, IA 50629  
Contact: Brian Delagardalle  
Phone: 319-240-8065  
Install Date: 9/12/2016  
Peak Flow: 0.50 MGD  
Upstream Treatment Process: Aeromod (activated sludge package plant)  
Approximate Run Hours: 39,024  
Disinfection Performance: Fecal Coliform 126/100 mL  
Corrective Maintenance: Standard lamp change after 12,000 hours



**NONOCON Preventive Maintenance:**

1. Once a month the cooling loop fluid level shall be inspected. Make sure the volume of cooling fluid in the reservoir is set to the proper level. This shall take less than 1 hour with basic hand/power tools.
2. Coolant within the cooling loop system shall be flushed and replaced once every 5 years. This shall take a single person 1 hour with basic hand/power tools.
3. The pumps powering the heat exchanging system shall be replaced every 25,000 hours. This shall take 4 hours with basic hand/power tools.
4. Tubes shall be inspected every 3 months. This shall take less than 30 minutes.
5. If needed based on the inspection, auxiliary cleaning of the tubes shall be done once a year. This shall take 5 hours with the provided brush.


**GLASCO UV**
**PARTS AND INFORMATION GUIDE**

PROJECT NAME: GARDNER  
 SYSTEM NAME: NONCON-5000-11-8 x 60

ITEM	PART #	QTY BANK	DESCRIPTION	LIST
Ultraviolet lamps	L-020760	88	Replace every 12,000 hours, HO	\$100
FEP Tube	M-80024T-86	60	Fluoropolymer Tube	\$300
Ballast	E-06070B	44	Lamp Drive Ballast -230V	\$650
Band Clamp	M-0250TC	120	Replace if defective	\$8.75
FEP Tube O-ring	M-75346O	120	Replace if defective	\$2.00
UV Monitor	E-10624M	1	1624 Digital UV Monitor Board	\$500
UV Sensor	E-4060SM	1	Photodiode UV Sensor	\$475
Lid Piston	M-47008R	4	GAS Door Piston	\$33.00
Pump	M-20000P	2	Heat Exchanger Pump	\$377.00

Glasco Ultraviolet  
 126 Christie Avenue  
 Mahwah, NJ 07430  
 (201) 934-3348 Fax (201) 934-3388  
[www.glascoouv.com](http://www.glascoouv.com)



**GLASCO UV**

Operator Training  
NONCON

[www.glascouv.com](http://www.glascouv.com)

## GARDNER, KS

### NONCON-5000-11-8 x 60 (2)

Reactors	2    Each 4.5 MGD
Modules per reactor	11 modules each with 8 lamps – 88 lamps per reactor and 176 total.
Flow rate	9.0 MGD total (4.5 per reactor)
Discharge permit	200 fc/100 ml
Water transmission	62%
Tubes	FEP Fluoropolymer
System control	PLC

# NONCON Wastewater



GLASCO UV

# NONCON

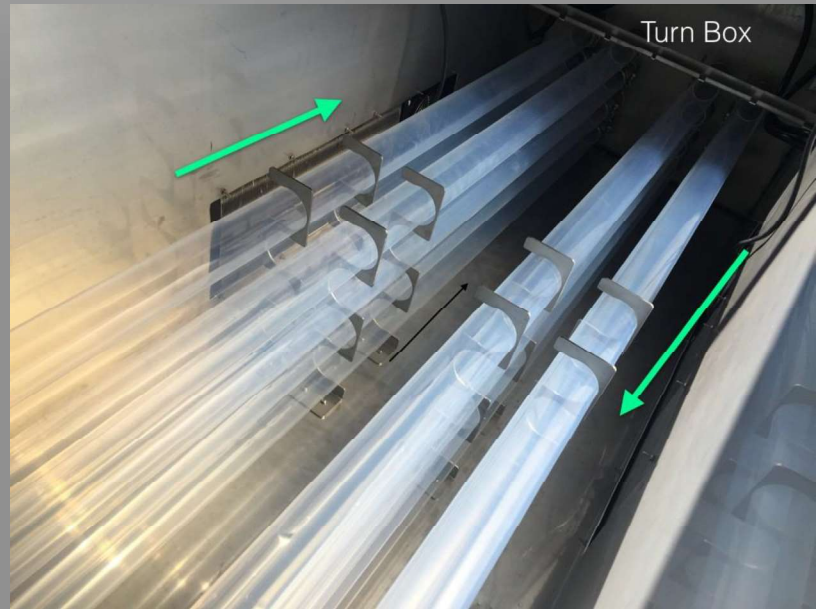


# NONCON FEP Tubes





# NONCON FEP Tubes



Turn Box



GLASCO UV



# How does all of this work? (1 of 2)

- It is hard to tell what is happening inside the system. As water enters the unit and flows through the tubes, it is exposed to UV light, which is invisible to the naked eye. The light comes from specialty mercury vapor lamps. The lamps are protected from the water by the use of clear like tubes, called quartz sleeves.
- The UV light destroys the microorganisms ability to reproduce by scrambling the DNA/RNA. This prevents reproduction.
- Sizing is based on a peak flow rate, the quality of the water (UV Transmission %) and the required discharge permit. Based on those inputs and a safety factor, a certain number of lamps are used.
- Once through the UV system, the water goes to discharge. At this point, periodic samples are taken to insure that the permit is being met.
- While the technology is very effective in disabling microbes, it does require maintenance and inspection.
  - The tubes can foul due to impurities in the water. Some bio slime can stick inside the tubes and they may need to be brushed periodically.

# How does all of this work? (2 of 2)

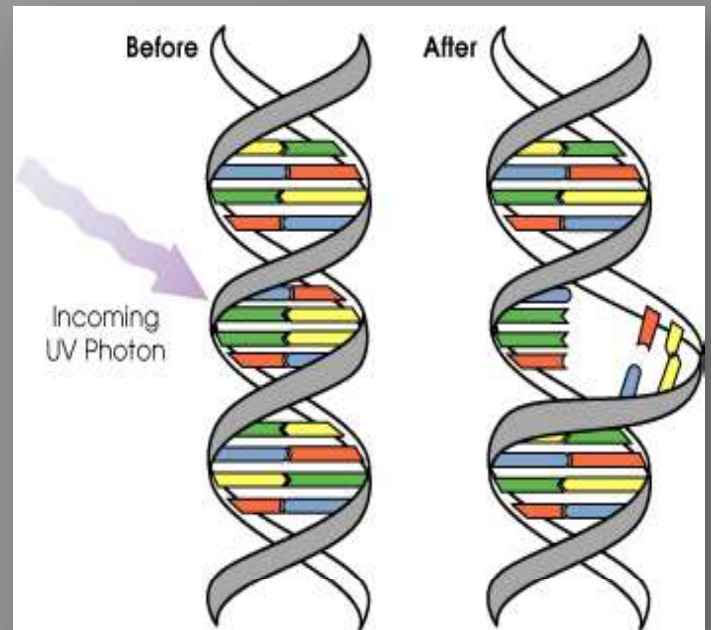
- The UV lamps need to be replaced every 12,000 hours.
- To help manage the system, a UV sensor has been placed inside a dedicated module. This sensor reads the actual UVC output at 100% from new. In the event of dropping, it could be aging lamps, lower transmission effluent, fouling of tubes or something else. This is meant as a helpful tool, but a low reading or a Zero reading may not indicate that the system is not working. The % on the meter has nothing to do with the kill.
- UV lamps are meant to be used 24 x 7, but they do have the ability to be cycled On/Of during the day.
- In the event of low flow or no flow, the UV system may become overheated. System has built in cooling to accommodate this.
- The UV system is powered from a remote Ballast Control Center / System Control Center. The main component is the ballast. This electronic device needs to be cooled. Fans and filter need to be inspected regularly.



GLASCO UV

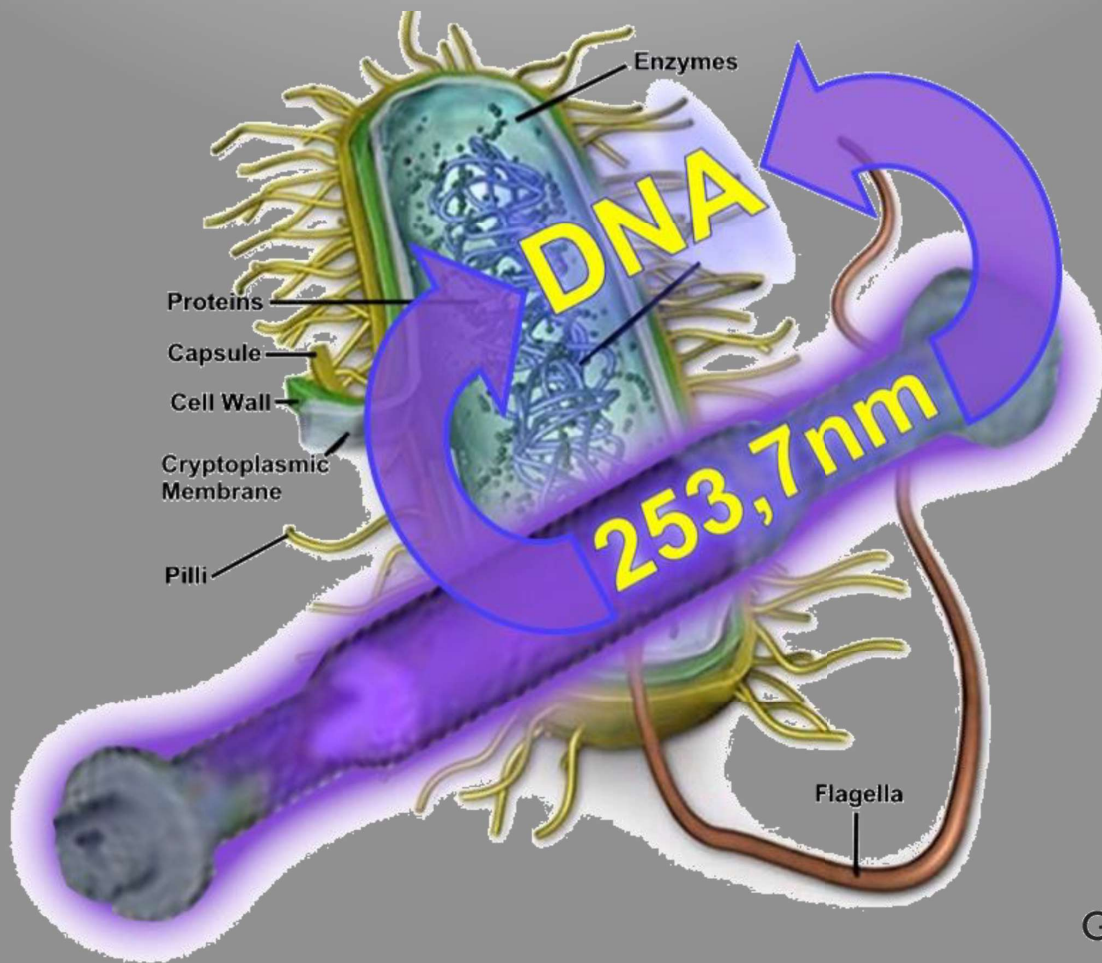
# About UV Light Disinfection

- UVC light damages DNA
- 254 nm wavelength most effective
- Dosage expressed millijoules/cm<sup>2</sup> (mJ/cm<sup>2</sup>)
- Sizing Intensity (mW/cm<sup>2</sup>) x Contact Time (sec)
- *Chlorine is concentration (mg/L) x Contact Time (minutes)*
- *Typical Dosage 30 mJ = 30,000 uWs/cm<sup>2</sup>*



GLASCO UV

# UV Light Disinfection



GLASCO UV

# Microorganisms



- E-Coli
- Salmonella
- Legionella
- Virbrio Cholerae
- Fecal Coliform

- Hepatitis
- Poliovirus
- Cocksackie
- Rotavirus

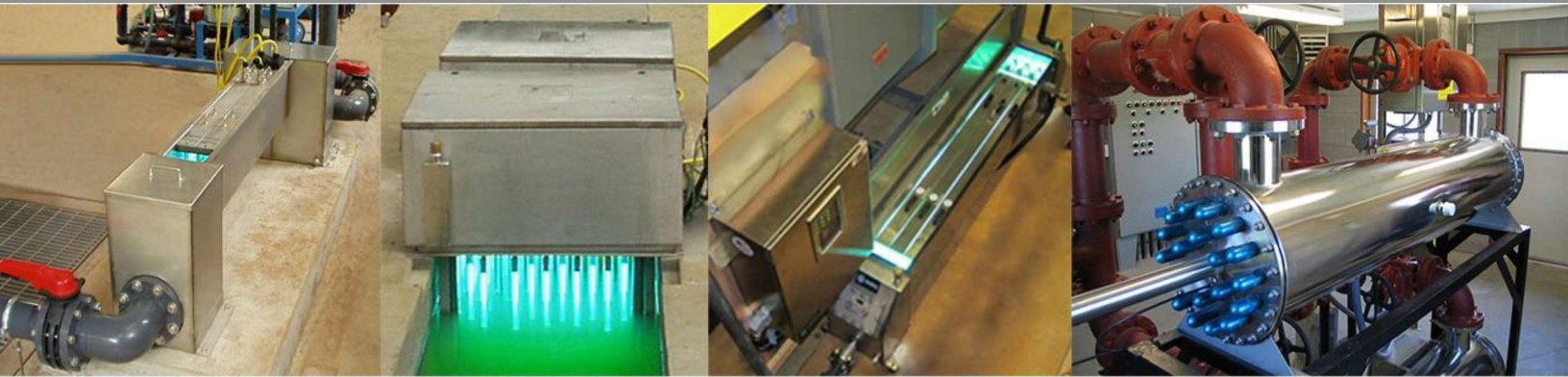
- Giardia
- Cryptosporidium

# E-Coli (bacteria) Common

- 90% (1 log) 1.5 mJ
- 99% (2 log) 2.4 mJ
- 99.9% (3 log) 4.1 mJ
- 99.99% (4 log) 5.6 mJ
- MOST Systems Sized at 30 mJ



# Wastewater Configurations



Horizontal

Vertical

FEP Tube

Chamber

NONCON is being used. FEP tube systems are the lowest maintenance of any of the systems due to the non stick of the TEFLON tubes. Unlike quartz based systems, that plate materials (iron, manganese, etc), the tubes remain clean and the lamps are not in the effluent.



GLASCO UV

# Safety



- UV light is dangerous - you must protect your eyes and skin.
- Electricity is present in the Ballast Control Center and the chamber. Always Power Off and lock out system.
- Lamps if broken can be sharp. Wear gloves.
- Units are pressurized. No work should be done unless depressurized.



GLASCO UV

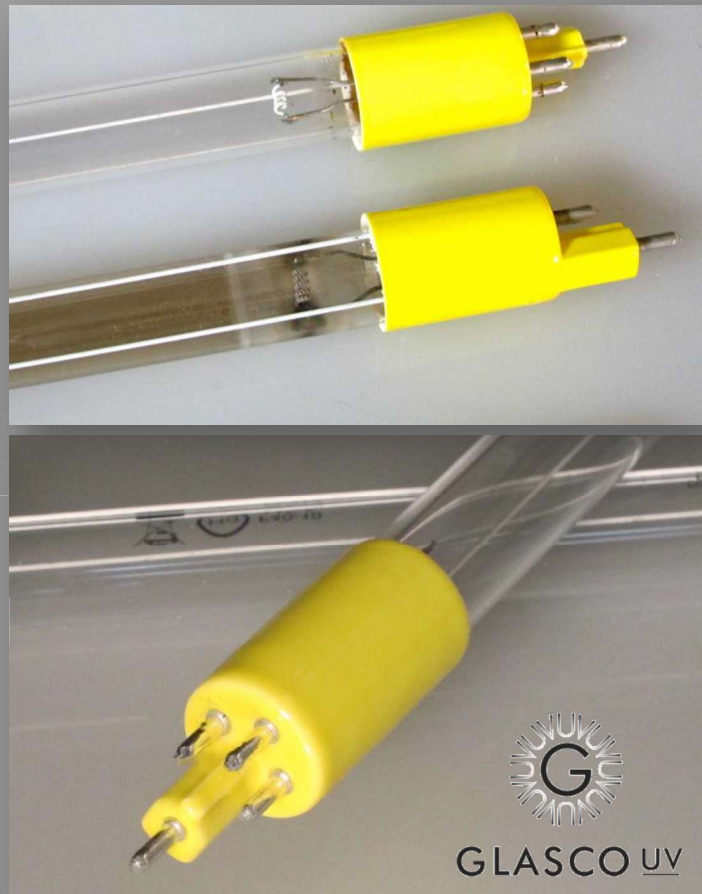


# What Comprises System?

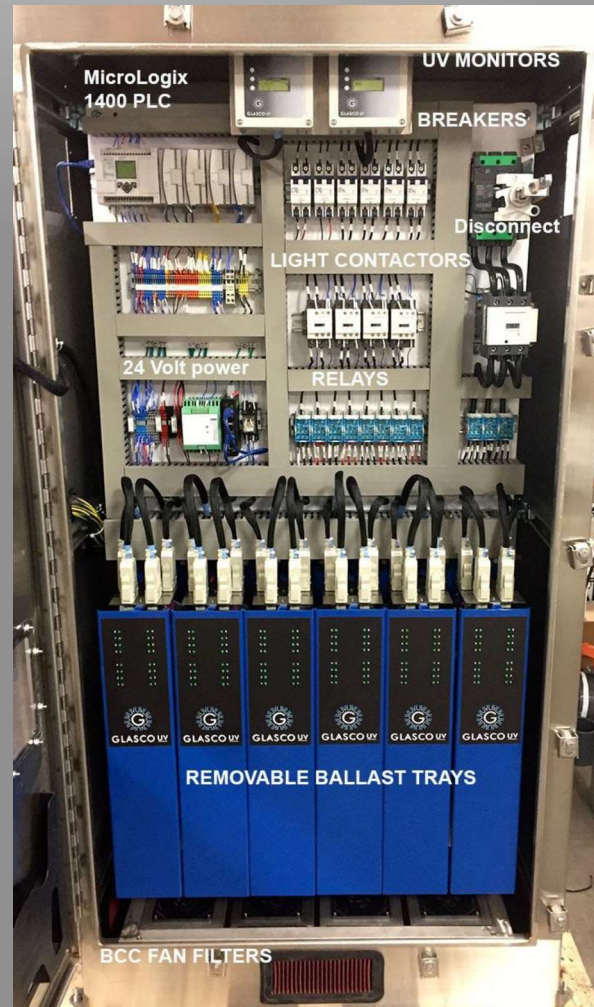
- Major Components
  - FEP Tube Reactor
  - UV modules
  - Remote electronics power and control UV lamps
  - UV monitoring sensor

# UV Lamps

- Low pressure mercury
  - High output 90%+ output in 254 nm
- 12,000 hours
- Rated in watts & UVC watts
- Solarizes (darkens) end life
- Sharp if broken



# Ballast Control Center



# Ballasts

- Mercury (Hg) Vapor Lamps require a ballast to operate
- Converts line current into the proper voltage, amperage and waveform
- Provides proper warm up and cool down
- Built in protection and controls (input power quality correction, end of lamp life, dimming)
- Needs to be kept cool and dry
- Life >10 years
- Ballast Control Centers house ballasts



GLASCO UV

# UV Monitoring

- A UV Sensor monitors output of a lamp offer lifetime (new 100%)
- Some sensors view an array of lamps and are auto cleaned - others monitor a single lamp
- Low UV reading may mean (lamps aging, fouled tubes or changes in wastewater quality)



# NONCON REACTORS





# Start Up Checklist

- Prior to Start Up:
  - Verification that components have been received
  - Verify that lamps are not damaged
  - Install UV lamps Install UV sensor
  - Verify that Ballast Control Center power is accurate
  - Power On UV System
  - Operate system breakers for individual modules
  - Check air flow in BCC and in NONCON reactor

# Start Up Checklist (2)

- Check to see if all lamps are working via PLC or lamp indicators
- Check to see that system is recording hours
- Check to see UV monitors output
  - Calibrate with new lamps in the wastewater to 100%



# Training Checklist

- Training:
  - How to install lamps and tubes
    - Preventing seal failures
  - How to Power On/Off ,breakers and disconnects
  - How to drain and pressurize
  - How to check the fans or air handling system
    - Check compressor for oil and maintenance
  - How to access and clean tubes with brush
  - How to re-calibrate the UV sensor

# How UV Systems are Sized

- Basic information required:

- Peak Flow                      Peak instant flow rate (avg and min)
- UVT%                         UV % transmission of effluent (typ 60-99%)
- TSS                            Total Suspended Solids (<30 mg/l)
- BOD5                         Biological Oxygen Demand (<30 mg/l)
- Fe                              Iron Level (<0.3 mg/)
- Influent                      Count in (???,??? mpn/100 ml) – Usually unknown
- Discharge Permit        ??/100 ml
- Location                      (indoor or outdoor)



# How To Size

- Methods for sizing
  - Bioassay (biology)
    - Systems biologically tested
    - Always used for municipal drinking water
  - EPA Point Source Summation Method – UV DIS (light physics)
    - Uses flow rate, UVT, lamp spacing, lamp output, end of lamp life, fouling
    - CON: UV manufacturer's can overstate their lamp output and the lamp life. This makes it harder for engineers to design specifications





**GLASCO UV**

For further information

[info@glascouv.com](mailto:info@glascouv.com)

[www.glascouv.com](http://www.glascouv.com)



# INSTALLATION, OPERATION AND MAINTENANCE MANUAL NONCON SERIES

*Fluoropolymer Ultraviolet Disinfection Systems*  
**NONCON-5000-11-8 x 60**



**Manufactured by:**

Glasco Ultraviolet  
126 Christie Street  
Mahwah, NJ 07430  
(201) 934-3348 Fax (201) 934-3388  
[www.glascouv.com](http://www.glascouv.com)

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# I. Safety Instructions

In order to protect end users and operators from injury, safety precautions must be followed. This Installation, Operation and Maintenance Manual outlines important safety issues. The following WARNING SYMBOLS will be found throughout the manual to alert the end users to take important precautions:



INFORMATION. This symbol signifies helpful information.



CAUTION This symbol indicates a potentially dangerous situation. Failure to adhere to this warning may lead to serious injury and or death.



ELECTRIC SHOCK. This symbol signifies helpful information and indicates a potentially dangerous situation. Failure to adhere to this warning may lead to serious injury and or death.



EYE PROTECTION. This symbol indicates that UV resistant eye protection must be worn to protect from UV light as well as debris.



HAND PROTECTION. This symbol signifies that hand protection must be worn to protect the lamps from skin oils as well as protect the operator from UV light and sharp materials caused by a broken lamp.

## II. General Information



Please read this manual prior to installing, starting up and operating the equipment. The equipment uses sophisticated technology, but has been designed to make operation and maintenance easy. If you have questions or feel uncomfortable performing any of the required tasks, please contact GLASCO UV. Do not attempt any service if you are untrained in electrical and mechanical operations of industrial equipment.

All local safety codes and regulations should be followed. As with servicing all wastewater plant equipment, ensure that your safety clothing and your tools are in good working order. In addition and a helpful reminder: be careful of slip, fall, overhead and trip hazards around the plant.



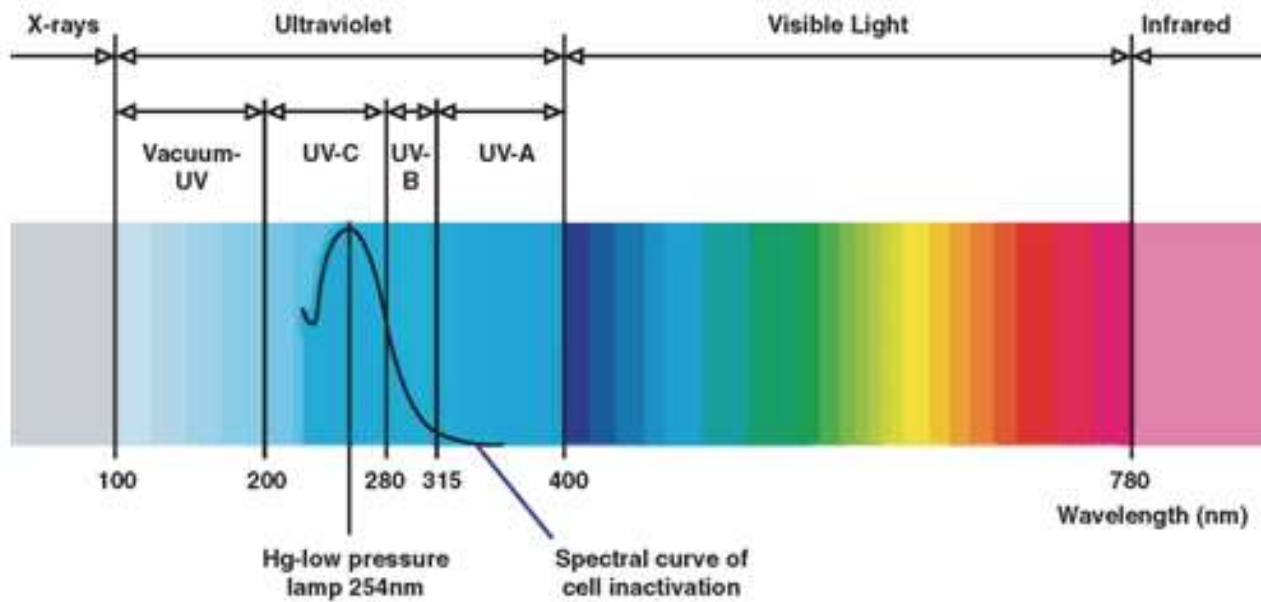
The UV system needs to be maintained and does require YEARLY replacement parts. GLASCO UV recommends that key spare and replacement parts be kept on hand. In order for the system to operate properly, please only use genuine factory parts. Failure to use genuine parts will void the warranty and may damage the system.



# 1. About Ultraviolet (UV) Disinfection

The technology uses UV light to target and disable disease-causing microorganisms (pathogens).

Over 100 years ago, scientists discovered that if you exposed pathogens to UV light, their reproduction was limited. The UV light source that they used, resided in the UVC range of the light spectrum. Specifically, they discovered that light in the 254 nanometer (nm) range was the most effective wavelength. Today, specialized UV lamps are used for a variety of disinfection applications.



When wastewater pathogens are exposed to UV light, their cells become damaged and this damage inhibits reproduction. The UV light, produced by a special UV lamp, damages the cell's DNA and RNA and once damaged, they are unable to replicate. This physical process renders them harmless.

The amount of damage is a result of the intensity of the UVC output multiplied by the time the water is exposed to the light. The applied dosage is expressed as milliwatt seconds per square centimeter (mW.s/cm<sup>2</sup>) or millijoules per square centimeter (mJ/cm<sup>2</sup>). Dosages of 30,000 uW.s/cm<sup>2</sup> (30 mJ cm<sup>2</sup>) are common for meeting a typical 126/100 200/100 ml (fecal/ecoli) discharge permit. Dosage will be inline with permit requirements.

Using UV for disinfection is a practical and acceptable technology, but do not confuse disinfection with sterilization. Sterilization means the complete and total inactivation of microorganisms.

### a) Why are plants and operators selecting UV technology?

- To move away from chlorine processes
- UV is considered a green technology
- No chemicals are added, so there is no need for chemical removal
- No chemical storage
- UV works instantly without requiring a residence time
- Easy maintenance

### b) What are limitations of UV technology?

The quality of the effluent entering UV system needs to be monitored. Effluent that is outside of the design parameters may cause permit violations.

Primary concerns relate to the UV transmittance (**UVT**) of the water and the Total Suspended Solids (**TSS**). While turbidity can impact UV system efficiency, UVT and TSS are the primary measurements.

**UVT** is the measurement of UV absorbing materials in the water. The levels are determined by using a 254 nm spectrophotometer to compare distilled water (100%) to an effluent sample through a 1 cm path. Many plants average 65%, but higher and lower values are not uncommon. The UVT% measurement is one of the primary numbers used to design a system so it is of great importance to ensure that the plant operates within design parameters.

Changes in wastewater UVT can be due to industrial wastes, breakdown in upstream processes or high mineral content (iron).

**TSS** is the measurement of solids in the water that will interfere with the delivery of UV light. Most plants have to meet a certain permit level (i.e. 30 mg/l) in order to satisfy the discharge permit. The solids, which vary in size, not only prevent proper UV light transmission, but actually house pathogens. The TSS number is impacted by the upstream processes (filter, membrane, clarifiers, etc.).

In addition to the above issues, the UV system needs to be cleaned on a periodic basis based on effluent conditions.

Cleaning involves using a brush and swapping it through the tube. This will need to be done based on plant operating conditions. Low flows or low pressure flows may lead to biofilm or other slime build up. Higher flows and higher pressure flows have a way of pushing debris and cleaning tube.

## 2. Preparation for Installing UV System

The following information is meant to be used by engineers, contractors, operators and owners to help better understand the technology, its benefits and potential hazards.



### a) Important Safety Information

UV light is extremely harmful to eyes and skin and will cause burns. Do not look directly or indirectly at the UV light. Do not expose your skin for any prolonged time. Use protective clothing and eyewear (make sure it is UV resistant) when servicing equipment.

If accidentally exposed to UV light for an extended period, immediately seek medical attention. Symptoms for eye exposure include burning, itching and redness. Symptoms for skin exposure are similar to sun burn.

Use gloves when handling lamps. The reason is that skin oils will adhere to the lamps and prevent UV light from properly emanating. If the lamps become dirty, wipe them with a lint free cloth with denatured alcohol.

UV lamps can become razor sharp if broken.

### b) Optimizing System Performance

The UV lamps need to be maintained. As a general rule, the lamps need to be changed after a year of usage (9,000-12,000 hours).

### c) Common Plant Design

Your UV system has been designed on a set of parameters. These parameters are described below and are based on the entire plant operating properly. Ensure that pre-processes are providing good effluent that meets the design parameters. If you have concerns, please test the effluent's UV transmission (UVT%) and compare it to the design parameters.

### d) Environmental Issues Relating to UV Lamps

UV lamps need to be recycled like fluorescent lamps because they contain mercury. Please follow your local recycling laws. Please visit [www.lamprecycle.org](http://www.lamprecycle.org) to find a recycler in your area. In the event that you are unable to find a disposal location, please contact GLASCO.

#### **e) Receiving UV Equipment and Spare Parts**

It is important to compare the shipment's contents to the actual packing list. Any deviations must be brought to the factory's attention. Additionally, lamps need to be inspected for damage. If shipment or parts are damaged, immediately contact factory and hold broken contents and their containers for inspection by shipping company.

#### **f) Electrical Configuration and Maintenance**

The UV disinfection system uses sophisticated electronics and specialty lamps. Unlike other equipment in the wastewater plant, the UV system's electronics require clean power. The system has been designed to use a certain specified voltage. UV equipment must be protected from surges. If the plant is susceptible to brown outs, please contact factory. Electronics may have fan cooling. If equipped, please clean filters.

# III. Components, Assembly and Operation

## 1. Components

The UV disinfection system will come with a number of components. The following list highlights the main ones.

- Stainless steel disinfection tube reactor – with cooling (environmental management system)
- Ballast Control Center (BCC) – houses electronics, controls, PLC and displays
- UV Modules
- Ultraviolet lamps
- UV monitoring probe
- Spare parts
- Safety supplies (optional)
- Warranty information

### **a) Stainless Steel Disinfection Reactor**

The horizontal fluoropolymer tube reactor system is designed with an inlet and outlet that will need to be piped to and from the facility's piping. The reactor comes with UV modules, cooling system, pressure release valves and UV monitoring system.



Water comes through the inlet box, into the pressurized disinfection tubes and out the pressurized outlet box. NONCON comes in gravity (45 psi) and high pressure (80 psi) configurations.

### **i) Environmental Management**

The UV lamps create heat and if not properly cooled, they will experience problems. High heat lowers UVC output. It diminishes lamp life. It can put a strain on the electronic ballasts. And high heat can damage the FEP Tubes.

To address this situation, the system will come equipped with an environmental management system (EMS). This may include fans, heat exchangers or other technologies that are designed to maintain an optimum operating temperature.

## ii) Utilities

The system uses a heat exchanger to keep the chamber cool. From time to time you will need to top off with anti freeze.



## b) Ballast Control Center (BCC)

The BCC will need to be mounted near the channel. Prior to final placement, check this distance before final placement.

The BCC requires clean power. Information on voltage and cycle will be on the nameplate. Power surges and fluctuations may damage the electronics of the system and void the warranty.

The BCC will contain the ballasts and other electrical controls. Fans have been integrated to cool the electrical components. The BCC will display operation status via PLC. Ensure that the fan filters are checked on a periodic basis.









The BCC needs to be located within a certain defined distance from the unit. Measure distance before final placement. Operators will be able to use displays for maintenance.

### c) Disinfection Lamp Modules

The disinfection modules are designed to hold the UV lamps in the UV reactor around the disinfection tubes. They are constructed of stainless steel and hold the lamps.

To connect or disconnect the module, simply unplug the module cable.







The UV lamp plugs into the connector on one end and is supported on the other end. Push lamp end cap into the module first and then plug into connector.

#### d) Disinfection Flow Through Tubes

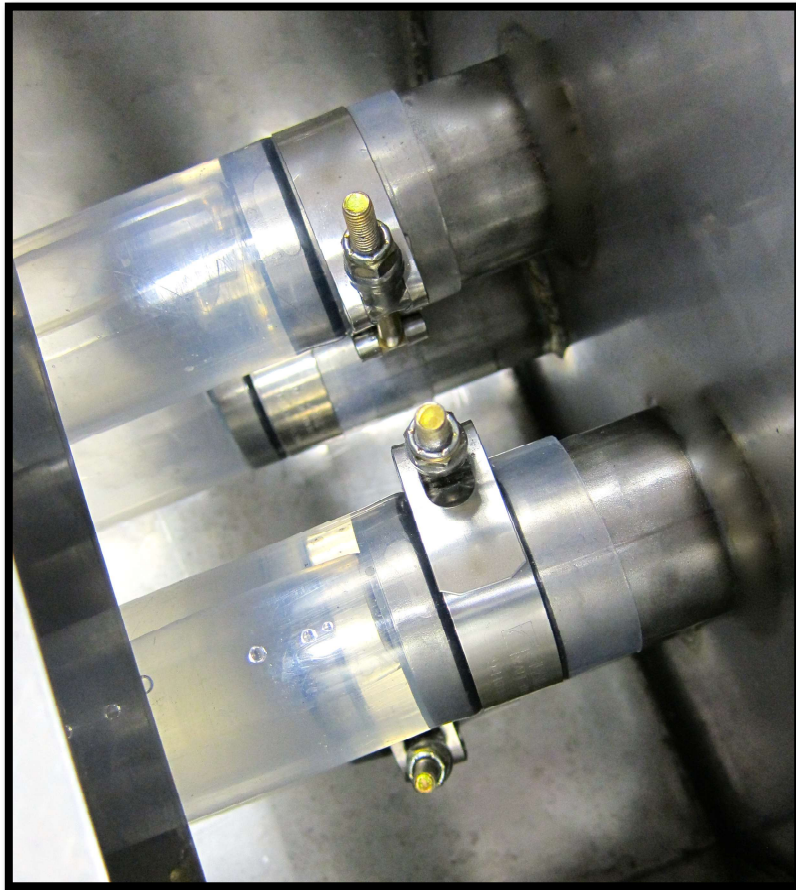
The disinfection modules are designed to hold the UV lamps in the UV reactor around the disinfection flow through tubes. The “NONCON 5000” uses non-conductive transparent fluoropolymer tubes to transport the water close to the UV lamps.

The UV lamps are positioned in the air and shine their rays (@ 254 nm) through the fluoropolymer tubes and to their intended targets, microorganisms. The lamps are not in the water.

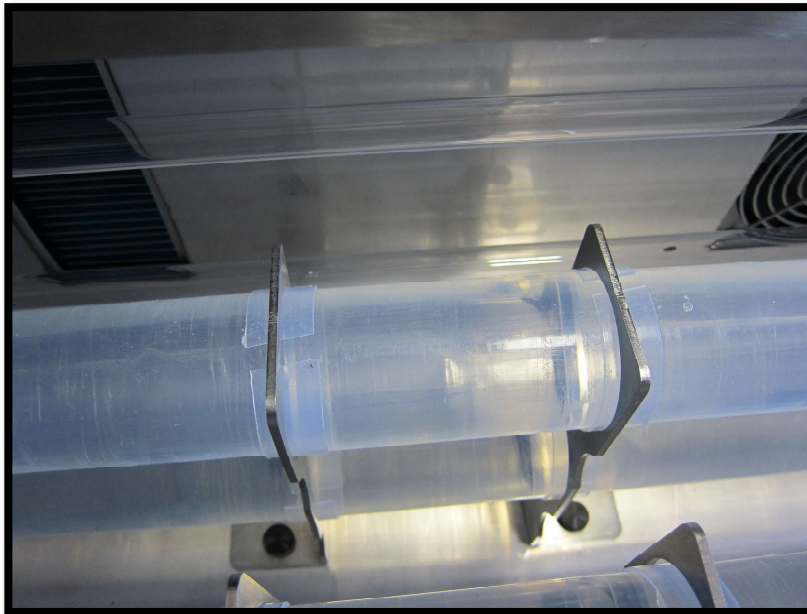
The tubes have a rating of 45 psi (the IP Series can handle 80 psi). When working around the tubes, insure that the pressure in the system has been released.







Tubes are attached to their corresponding stainless steel ports via a band clamp. After initial start up, check and re-tighten. Water and vibration may have loosened in shipping or start up.



A stainless steel support structure holds the suspended tubes. Tubes have protection against the stainless supports to prevent vibrations from cutting tubes.

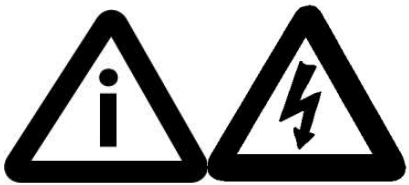
## 2. Lamps Inspection and Installation



Insure that lamps have not been broken. We recommend that you use gloves when handling lamps to prevent them from becoming dirty. If lamps have broken, take extra care to prevent yourself from becoming injured.

Take the module and place it on a clean work surface or hang in on a factory supplied optional wall rack. You will need to install a lamp into each lamp holder.

## 3. Ballast Control Center (BCC)



The plant electrician will need to bring protected power to the BCC. Your UV system has been designed to work on a constant power supply. The electronic ballasts are susceptible to power fluctuations. Low voltage will cause ballast failures. The ballasts have been labeled with the voltage and cycle. It is imperative that the appropriate voltage range is maintained. If you have questions, call factory. Failure to provide adequate power will void the warranty.

This configuration incorporates a remote modified NEMA style enclosure with window kit. The enclosure will have been designed for indoor or outdoor use. If used in an outdoor environment, consult factory for recommendations. Glasco recommends protecting the enclosure from high heat and extreme environmental conditions. If this information was not taken into consideration during the design phase, the BCC may need to be modified.

The BCC is generally provided with basic displays: Lamp on/off indicators, running time meter and UV intensity meter. The BCC will have an Hand/Off/Auto.

The BCC contains ballasts. The ballasts drive the UV lamps. In order to keep the ballasts running at optimum performance, it is necessary to cool the ballasts. As ballasts heat up, they become exponentially less efficient. The BCC will come with a fan cooling system. Insure that the fans are operational and filters are checked and cleaned on a periodic basis.



**a) BCC OUI (See PLC SOP document)**

*1) Lamp Status*

*2) Running Time Metering*

*3) Ultraviolet Output*

After 100-hour burn-in, the UV display is procedurally set to Full-Scale (100%). This is done during nominal operating and water quality conditions. This UV reading is not NIST calibrated to absolute  $\text{mW}/\text{cm}^2$  intensity. It is simply a relative % of a single lamp. Initial setup is 100 %, since everything is brand new.

When inserting the sensor, insure that the actual sensor is touching the lamp. This will allow you to get the best reading.



See attached O&M Manual for your UV monitoring system



## **b) BCC Electrical**

### *1) Over-Current and Ground Fault Protection*

The system features Over-current protection via Circuit Breakers, as well as Ground Fault Protection via GFCI devices. These are housed in the BCC.

Circuit Breakers CBs are provided to protect a single channel Module or groups of channel Modules. Some systems are wired with multiple CBs, for example, so neighboring Modules remain operating if one CB trips. One CB handles Odd numbered Modules, while one CB protects Even numbered Modules. Your system will be clearly labeled inside.

A GFCI is provided, within the Ballast Control Center, and is dedicated for each individual reactor Module. So a fault in any single Module does not affect the disinfection performance of any other Module.

The functions of Over-current and Ground Fault protection may be combined in a single device. These are wired for dedicated individual Module protection like the GFCI discussion above, when used.

### *2) Electronic Ballast*

The provided electronic ballast is specially designed for germicidal performance in challenging water treatment conditions. The ballast controls the start-up and maintenance of the conductive arc in the mercury vapor lamp under conditions of varying temperature.

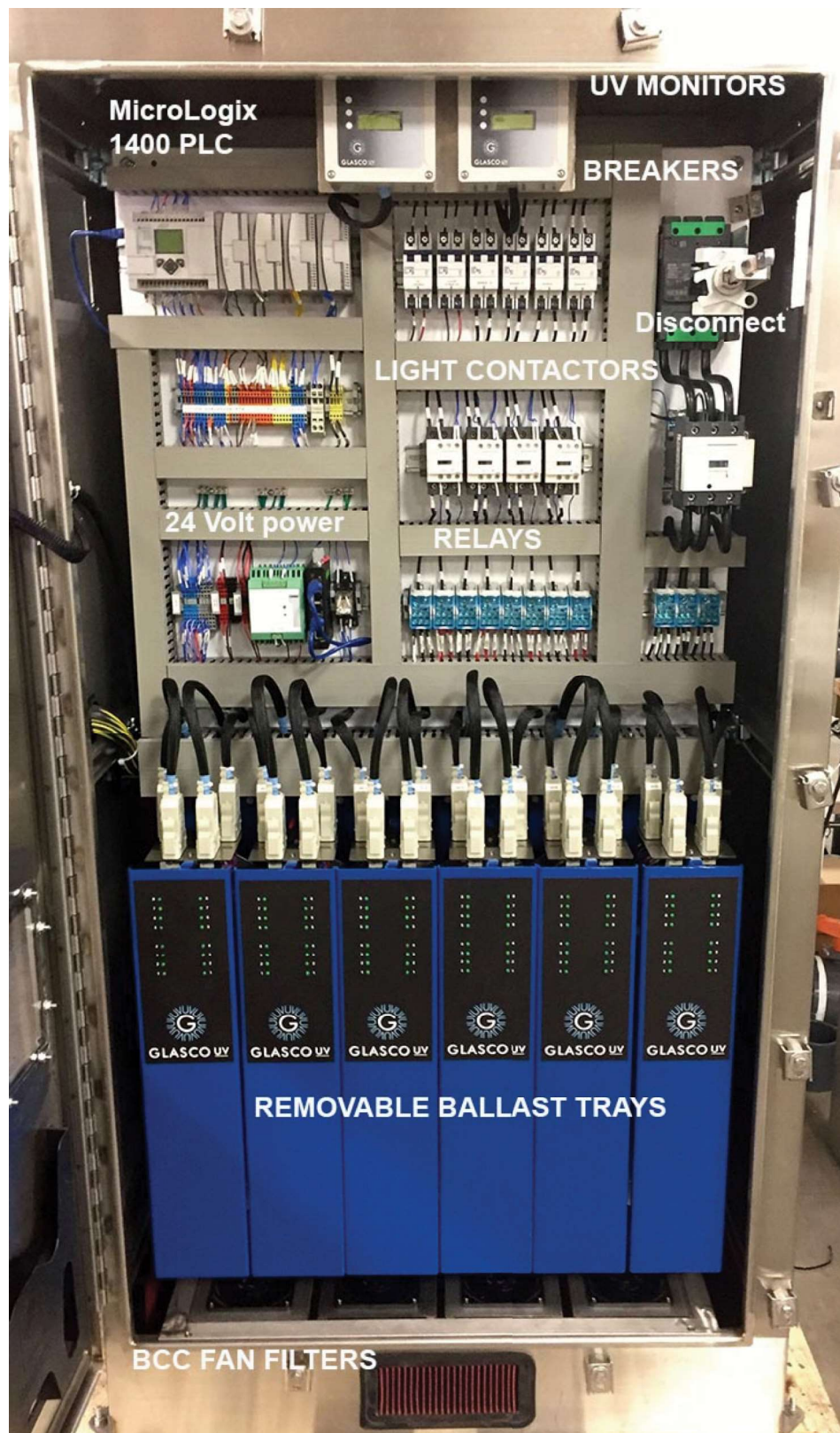
The ballasts will need to be replaced if found defective. To replace the ballast, simply disconnect the wires, loosen holding screws and insert new ballast. Send defective ballast back to for warranty work or out of warranty service.

To Power Off:

1. Turn off breaker from main PLANT control panel by others and use lock out. If plant does not have a lock out procedure then following all power down instructions and leave note at breaker stating time and date shut off and a message not to power up.
2. Turn off UV external On/Off Switch (if H/O/A switch turn to OFF)
3. Turn off Internal Breaker
4. Disconnect module cable from BCC



The BCC connects to the disinfection reactor via a multi pin cable. Power down from BCC before disconnecting. Undo latch and pull cable from receptacle.



## **IV. Parts List – See Project List**

Fluoropolymer Tube

UV Lamp

Electronic Ballast

UV Sensor

UV Meter

Lamp LED

Run Time Meter

Box Fan

Band Clamp

Heat Exchanger

Glasco Ultraviolet  
126 Christie Avenue  
Mahwah, NJ 07430  
(201) 934-3348 Fax (201) 934-3388



## V. Troubleshooting UV Horizontal Tube System

This guide provides information and recommendations on how to correct basic operational problems. When performing any of these tasks, be sure to wear protective clothing and eyewear. In addition, protect yourself from shock hazards.

Symptom:	Check:
Power Center	
UV lamp LED(s) Off	Power Off, wait, power On, observe LED(s). The “intelligent” ballasts will keep a lamp Off for various causes, in some cases this may be a false trip. If the LED(s) come On and then flicker Off, it means that the ballast is good and that the problem is past the ballast. If problem recurs, see “LED stays Off”.
UV lamp LED(s) stays Off.	Power Off, Open Reactor, Remove cable from a known good module and connect known bad module into the receptacle. If the problem is fixed, then it is most likely bad ballast. If the problem follows, it is most likely associated with module. If suspected to be the module, lift module out. Examine for damage, water infiltration and really blackened lamp ends. If none, power On, and observe through your UV face shield, at safe distance, if lamp actually lights. If Lamp lights and LED is On, suspect loose electrical connection. If Lamp lights and LED is still Off, call Authorized Service for Ballast Control Center repair. If lamps are still Off, suspect bad ballast and replace.
GFCI Breaker Off (All lamp LEDs for a module off)	Ground Fault occurred. May be a false trip. Power the effected module Off (if not already powered by GFCI On/Off Breaker combination). Examine cable connectors for tightness. If suspicious, loosen, disconnect, clean, dry and re-connect. Lift module out of channel and examine for water infiltration. If so see “Water Infiltration”. Reset GFCI, and Power On, (or Power On and reset GFCI). If problem recurs, refer to Authorized Service for Ballast Control Center repair.
UV Monitor Alarm UV Monitor Warn UV Monitor Low	Check Panel LED to see if lamp is extinguished. Check the age of the Lamp. Refer to Lamp replacement records. Check the physical positioning of the UV Sensor Probe. The sensor element inside may not be “looking” in the same direction as the probe tube is pointing. The probe may have shifted within the retaining compression nut. Sometimes this is pulled by the weight of the cable. Check for debris or film on the UV probe window. Clean and rough position with Lamp powered Off.

## VI. Maintenance Schedule

The time and frequency of maintenance has a lot to do with the specific wastewater plant and the quality of the actual water. Due to the nature of wastewater, some plants will have to do more maintenance than others.

The primary maintenance task is keeping the quartz sleeves clean. This can be an every day task (worst case scenario) or more infrequently (quarterly). This schedule will be determined after start up.

ITEM	FREQUENCY	DESCRIPTION
UV Lamps Operation	Weekly to monthly	Check LEDs to see if lamps are operating
UV Lamp Change	1x every 12-14 months or after 9,000 hours	Replace all lamps
Ballast Control Center	Monthly	Check for moisture in enclosure. Ensure that seals are functional.
Ballast Control Center	Bi Yearly	Clean BCC with water and or stainless steel polish. No not hose clean, as water will get into fans and vents.
Fan Operation	Monthly	Check to see if working
Fan Filters	Monthly	Clean periodically to allow for cooling.
UV Meter	Monthly	Check for low readings. If low, check for debris on sensor, moisture, high heat or bad lamps
Modules	2x a year	Remove modules for visual inspection.

## VII. Attachments

If your unit came with optional equipment, instructions will be attached to this manual. This includes informational material on the following:

UV Monitoring System  
Wiring Diagrams

# WARRANTY REGISTRATION

MODEL NUMBER: \_\_\_\_\_

SERIAL NUMBER: \_\_\_\_\_

REPRESENTATIVE NAME: \_\_\_\_\_

INSTALLATION DATE: \_\_\_\_\_

NAME: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

CITY: \_\_\_\_\_ STATE: \_\_\_\_\_ POSTAL CODE: \_\_\_\_\_

COUNTRY: \_\_\_\_\_

PHONE: \_\_\_\_\_ EMAIL: \_\_\_\_\_

Please fill out the above information and forward it to GLASCO. This will provide the WWTP with a five (5) year warranty on the stainless steel components and a one (1) year warranty on the electrical components. UV lamps are warranted for one year.

This warranty applies to equipment that has been installed and maintained according to the instructions in this manual. GLASCO is not responsible for damage due to improper use, operation or installation. GLASCO is not responsible for improper plant design or changes to the effluent.

The warranty applies to replacing defective equipment. GLASCO UV shall have no liability hereunder, either direct or contingent, for any consequential damages.

Please note that bad power (spikes, brown outs, surges) will damage the UV system electronics. System operates +/- 5% of input voltage.

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